Light Attenuation in the Experimental Lakes Area - 1980 Data

J.A. Shearer and E.R. DeBruyn

Western Region
Department of Fisheries and Oceans
Winnipeg, Manitoba R3T 2N6

May 1981

Canadian Data Report of Fisheries & Aquatic Sciences No. 259

Canadian Data Report of Fisheries and Aquatic Sciences

These reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of Data Reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

Data Reports are not intended for general distribution and the contents must not be referred to in other publications without prior written clearance from the issuing establishment. The correct citation appears above the abstract of each report.

Rapport statistique canadien des sciences halieutiques et aquatiques

Ces rapports servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des Rapports statistiques reflètent la vaste gamme des intérêts et politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Les Rapports statistiques ne sont pas préparés pour une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact paraît au haut du résumé de chaque rapport.

Canadian Data Report of
Fisheries and Aquatic Sciences 259

May 1981

LIGHT ATTENUATION IN THE EXPERIMENTAL LAKES AREA - 1980 DATA

by

J. A. Shearer and E. R. DeBruyn

Western Region
Department of Fisheries and Oceans
Winnipeg, Manitoba R3T 2N6

This is the 35th Data Report
from the Western Region, Winnipeg

© Minister of Supply and Services Canada 1981

Cat. no. Fs 97-13/259 ISSN 0706-6465

Correct citation for this publication:

Shearer, J. A., and E. R. DeBruyn. 1981. Light attenuation in the Experimental Lakes Area - 1980 data. Can. Data Rep. Fish. Aquat. Sci. 259: iv + 50 p.

TABLE OF CONTENTS

	Page
ABSTRACT/RESUME	iv
INTRODUCTION	1
DATA COLLECTION AND ANALYSIS	1
REFERENCES	1

LIST OF APPENDICES

Appendix		Page
1	This appendix lists data for vertical light attenuation profiles taken in 1980 at ELA . . .	3
2	In this appendix, the measured irradiances (as percentages of surface irradiance) are plotted against depth (in meters)	23

ABSTRACT

Shearer, J. A., and E. R. DeBruyn. 1981. Light attenuation in the Experimental Lakes Area - 1980 data. Can. Data Rep. Fish. Aquat. Sci. 259: iv + 50 p.

Depth profiles of photosynthetically active radiation were measured periodically in thirteen lake basins at the Experimental Lakes Area during 1980. These data are tabulated and plots of irradiance versus depth are provided. Mean attenuation coefficients have been calculated from the data.

Key words: light penetration; water transparency; limnological data.

RESUME

Shearer, J. A., and E. R. DeBruyn. 1981. Light attenuation in the Experimental Lakes Area - 1980 data. Can. Data Rep. Fish. Aquat. Sci. 259: iv + 50 p.

Nous avons mesuré périodiquement, au cours de l'année 1980, les profils de profondeur de la radiation photosynthétique dans treize bassins de lacs situées dans la Région des Lacs Expérimentaux. Nous avons établi des tables de ces données et nous avons figuré graphiquement les émissions de radiations face à la profondeur. A partir de ces données, nous avons calculé les coefficients moyens d'atténuation.

Mots-clés: pénétration de la lumière; transparence de l'eau; données limnologiques.

INTRODUCTION

This report presents irradiance versus depth data collected during 1980 for selected basins within the Experimental Lakes Area (E.L.A.), northwestern Ontario. The data were collected for use in obtaining estimates of integral phytoplankton production (DeBruyn and Shearer 1981; Fee 1977), and the irradiances recorded here can be defined as measures of photosynthetically active radiation (PAR).

The content and format of this report are similar to those found in previous volumes of this annual series (Shearer 1976; Shearer and DeClercq 1976, 1977, 1978, 1979, 1980). A description of the methodology for collection and analysis of the data is provided. The collected attenuation data are presented both in tables and graphs.

DATA COLLECTION AND ANALYSIS

The vertical attenuation of PAR was monitored in thirteen E.L.A. basins during the ice-free season of 1980. These basins are numbers 114, 222, 223, 226NE, 226SW, 227, 239, 302N, 302S, 304, 382, 382 Bay and 661. (See J. Fish. Res. Board Can. 28(2), 1971).

Experimental nutrient enrichments of Lakes 226NE, 226SW and 227 were continued during 1980 (Schindler and Fee 1974). Lake 302N was last enriched in 1978 and L304 last received artificial enrichment in 1976. Lakes 114 and 223 were undergoing controlled acidification during 1980.

In late June 1980, a forest fire burned through the watersheds of Lakes 239, 304 and 661.

The separate basins of Lakes 226 and 382 are maintained by plastic "sea curtains". A similar curtain was removed from Lake 302 near the beginning of the 1980 sampling period.

The thirteen surveyed basins range in surface area from 1.2 to 56 hectares and in maximum depth from 0.75 to 30 meters.

Attenuation profiles were taken routinely at time intervals of from one to four weeks for each lake. The usual interval for most lakes was two weeks.

A Licor LI-192S cosine response underwater quantum sensor and LI-185 meter were used for all profiles shown in this report. Simultaneous comparative profiles were taken with this sensor and with two scalar quantum sensors (Licor LI-193S)and Biospherical Instruments QSP 200) on several occasions. All three sensors showed similar relative responses to changes in depth (Shearer, unpublished data). Under clear skies, the attenuation coefficient varies more with solar elevation than it does with sensor design (Shearer and DeClercq 1980; Shearer, unpublished data).

Because of the importance of solar elevation to the vertical attenuation of light (Jerlov and Nygård 1969; Kirk 1977), profiles usually were taken during mid morning or mid afternoon (i.e. at an intermediate solar elevation). This procedure has been recommended by Combs (1977). Under overcast sky conditions, this precaution is not necessary.

For each profile, a surface reading was taken in air. After division by the immersion factor for the LI-192S sensor (1.34), this corrected value served as the surface reading (100%) to which all the underwater values for that profile are referenced. Whenever cloudy sky conditions caused fluctuations in the surface reading during the profiling period, a LI-190S sensor was used as a deck cell and all underwater readings were subsequently corrected for variations in the deck value.

The profiles included in this report are presented in two forms. Appendix 1 lists the measured values of irradiance versus depth. The irradiance values have been corrected for the immersion effect and converted to percentages of the coincident surface irradiance. Appendix 2 presents plots of these data along with fitted curves calculated from the data. In both appendices the data are grouped by lake basin and listed chronologically.

REFERENCES

COMBS, W. S., Jr. 1977. The measurement and prediction of irradiances available for photosynthesis by phytoplankton in lakes. Ph.D. Thesis, University of Minnesota, Minneapolis, MN.

DeBRUYN, E. R., and J. A. SHEARER. 1981. Phytoplankton primary production, chlorophyll and suspended carbon in the Experimental Lakes Area - 1980 data. Can. Data. Rep. Fish. Aquat. Sci. 260: iv + 52 p.

FEE, E. J. 1977. A computer program for estimating annual primary production in vertically stratified waterbodies with an incubator technique. Can. Fish. Mar. Serv. Tech. Rep. 741: v + 38 p.

JERLOV, N. G., and K. NYGÅRD. 1969. Influence of solar elevation on attenuation of underwater irradiance. Rep. Institut Fysisk Oceanografi, Copenhagen, 4: 9 p.

KIRK, J. T. O. 1977. Use of a quanta meter to measure attenuation and underwater reflectance of photosynthetically active radiation in some inland and coastal south-eastern Australian waters. Aust. J. Mar. Freshw. Res. 28: 9-21.

SCHINDLER, D. W., and E. J. FEE. 1974. The Experimental Lakes Area: Whole lake experiments in eutrophication. J. Fish. Res. Board Can. 31: 937-953.

SHEARER, J. A. 1976. Light extinction measurements in the Experimental Lakes Area - 1974 data. Can. Fish. Mar. Serv. Tech. Rep. 615: 97 p.

SHEARER, J. A., and D. R. DeCLERCQ. 1976. Light extinction measurements in the Experimental Lakes Area - 1975 data. Can. Fish. Mar. Serv. Tech. Rep. 646: 113 p.

_____. 1977. Light extinction measurements in the Experimental Lakes Area - 1976 data. Can. Fish. Mar. Serv. Data Rep. 33: iv + 103 p.

SHEARER, J. A., and D. R. DeCLERCQ. 1978. Light extinction measurements in the Experimental Lakes Area - 1977 data. Can. Fish. Mar. Serv. Data Rep. 73: iv + 49 p.

_____. 1979. Light extinction measurements in the Experimental Lakes Area - 1978 data. Can. Fish. Mar. Serv. Data Rep. 121: iv + 59 p.

_____. 1980. Light extinction in the Experimental Lakes Area - 1979 data. Can. Data Rep. Fish. Aquat. Sci. 189: iv + 63 p.

APPENDIX 1

This appendix lists the data for vertical attenuation profiles taken at the E.L.A. during 1980.

All times are local, i.e. Central Daylight (CDT) before 26 October and Central Standard (CST) thereafter.

Each extinction (or attenuation) coefficient is the negative slope of a regression of the natural logarithm of the percent surface irradiance on depth. R**2 (or r^2) is a measure of the linearity of the above regression, wherein 1.00 would represent perfect linearity.

The depths are in meters. Irradiance values are actual, rather than fitted, and are given as percentages of the surface value (corrected for surface effect).

Lake 114

DATE: 29 APR TIME: 1655 HOURS
EXTINCTION COEFFICIENT: .92 R**2: .9972

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	52.64	1.00	33.18	2.00	13.72	3.00	6.06
4.00	2.25								

DATE: 15 MAY TIME: 1145 HOURS
EXTINCTION COEFFICIENT: .65 R**2: .9971

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	62.44	1.00	47.40	2.00	24.61	3.00	12.76
4.00	7.20								

DATE: 3 JUN TIME: 1620 HOURS
EXTINCTION COEFFICIENT: .61 R**2: .9958

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	66.56	1.00	48.36	2.00	24.68	3.00	15.11
4.00	8.26								

DATE: 18 JUN TIME: 1540 HOURS
EXTINCTION COEFFICIENT: .60 R**2: .9989

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	71.07	1.00	51.61	2.00	28.07	3.00	16.57
4.00	8.78								

DATE: 3 JUL TIME: 1500 HOURS
EXTINCTION COEFFICIENT: .64 R**2: .9989

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	72.34	1.00	48.91	2.00	25.90	3.00	14.22
4.00	7.65								

DATE: 21 JUL TIME: 1120 HOURS
EXTINCTION COEFFICIENT: .79 R**2: .9897

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	55.07	1.00	33.04	2.00	15.42	3.00	7.71
4.00	3.96								

DATE: 4 AUG TIME: 1135 HOURS
EXTINCTION COEFFICIENT: .99 R**2: .9987

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	55.50	1.00	32.14	2.00	12.13	3.00	4.94
4.00	1.75								

DATE: 16 AUG TIME: 1640 HOURS
EXTINCTION COEFFICIENT: 1.00 R**2: .9950

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	49.02	1.00	28.76	2.00	10.13	3.00	4.28
4.00	1.70								

DATE: 1 SEP TIME: 1125 HOURS
EXTINCTION COEFFICIENT: .79 R**2: .9919

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	60.70	1.00	34.55	2.00	16.63	3.00	7.98
4.00	4.20								

DATE: 15 SEP TIME: 1105 HOURS
EXTINCTION COEFFICIENT: .62 R**2: .9948

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.12	1.00	44.33	2.00	24.30	3.00	14.03
4.00	7.76								

Lake 114

DATE: 2 OCT TIME: 1500 HOURS
EXTINCTION COEFFICIENT: .68 R**2: .9957

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	64.61	1.00	43.55	2.00	22.01	3.00	11.63
4.00	6.56								

DATE: 13 OCT TIME: 1150 HOURS
EXTINCTION COEFFICIENT: .72 R**2: .9899

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	60.00	1.00	38.27	2.00	17.73	3.00	9.73
4.00	5.40								

DATE: 27 OCT TIME: 1535 HOURS
EXTINCTION COEFFICIENT: .75 R**2: .9853

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	48.16	1.00	32.66	2.00	16.75	3.00	8.30
4.00	4.32								

Lake 222

DATE: 15 MAY
EXTINCTION COEFFICIENT: 1.04
TIME: 1035 HOURS
R**2: .9943

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	46.00	1.00	25.00	2.00	9.50	3.00	4.20
4.00	1.50	5.00	.40						

DATE: 9 JUN
EXTINCTION COEFFICIENT: 1.13
TIME: 0850 HOURS
R**2: .9850

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	48.73	1.00	25.04	2.00	9.47	3.00	4.06
4.00	1.49	5.00	.22						

DATE: 21 JUL
EXTINCTION COEFFICIENT: .91
TIME: 0900 HOURS
R**2: .9880

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	51.51	1.00	30.99	2.00	14.03	3.00	7.50
4.00	2.91	5.00	.75						

DATE: 15 AUG
EXTINCTION COEFFICIENT: 1.02
TIME: 1715 HOURS
R**2: .9972

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	54.97	1.00	31.61	2.00	12.09	3.00	4.95
4.00	1.81	5.00	.49						

DATE: 11 SEP
EXTINCTION COEFFICIENT: 1.15
TIME: 0950 HOURS
R**2: .9954

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	40.20	1.00	21.59	2.00	6.40	3.00	2.34
4.00	.83	5.00	.25						

DATE: 13 OCT
EXTINCTION COEFFICIENT: 1.39
TIME: 1050 HOURS
R**2: .9937

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	30.86	1.00	14.62	2.00	3.57	3.00	.91
4.00	.26	5.00	.08						

Lake 223

DATE: 29 APR
EXTINCTION COEFFICIENT: .43
TIME: 1405 HOURS
R**2: .9887

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	79.12	1.00	51.05	2.00	39.14	3.00	26.37
4.00	18.29	5.00	11.91	6.00	7.91	7.00	5.36	8.00	3.49
9.00	2.51	10.00	1.65	11.00	1.05	12.00	.61	13.00	.21

DATE: 15 MAY
EXTINCTION COEFFICIENT: .44
TIME: 1000 HOURS
R**2: .9869

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	77.88	1.00	60.70	2.00	38.94	3.00	28.63
4.00	19.24	5.00	13.74	6.00	9.39	7.00	6.18	8.00	4.12
9.00	2.68	10.00	1.65	11.00	.97	12.00	.48	13.00	.21

DATE: 9 JUN
EXTINCTION COEFFICIENT: .42
TIME: 0810 HOURS
R**2: .9460

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	81.36	1.00	63.81	2.00	45.46	3.00	34.62
4.00	26.80	5.00	20.42	6.00	14.84	7.00	10.21	8.00	7.02
9.00	4.55	10.00	2.22	11.00	.93	12.00	.31		

DATE: 19 JUN
EXTINCTION COEFFICIENT: .44
TIME: 0840 HOURS
R**2: .8906

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	77.91	1.00	65.44	2.00	49.08	3.00	39.73
4.00	29.92	5.00	21.97	6.00	17.45	7.00	11.84	8.00	8.41
9.00	5.77	10.00	2.73	11.00	.76	12.00	.16		

DATE: 2 JUL
EXTINCTION COEFFICIENT: .46
TIME: 0815 HOURS
R**2: .9049

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	80.03	1.00	63.28	2.00	44.67	3.00	31.64
4.00	23.82	5.00	18.05	6.00	13.40	7.00	9.58	8.00	6.70
9.00	4.54	10.00	2.10	11.00	.54	12.00	.12		

DATE: 21 JUL
EXTINCTION COEFFICIENT: .39
TIME: 0805 HOURS
R**2: .8557

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	73.02	1.00	58.98	2.00	46.54	3.00	38.92
4.00	32.50	5.00	26.32	6.00	22.23	7.00	17.09	8.00	12.20
9.00	7.62	10.00	3.61	11.00	1.08	12.00	.23		

DATE: 31 JUL
EXTINCTION COEFFICIENT: .40
TIME: 1005 HOURS
R**2: .8366

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	72.03	1.00	55.13	2.00	40.66	3.00	35.07
4.00	28.92	5.00	23.91	6.00	20.13	7.00	16.24	8.00	12.03
9.00	8.15	10.00	3.40	11.00	1.00	12.00	.17		

DATE: 15 AUG
EXTINCTION COEFFICIENT: .50
TIME: 1635 HOURS
R**2: .8345

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	76.08	1.00	64.73	2.00	46.56	3.00	32.93
4.00	23.28	5.00	17.49	6.00	12.95	7.00	10.16	8.00	7.21
9.00	4.83	10.00	2.18	11.00	.58	12.00	.03		

DATE: 31 AUG
EXTINCTION COEFFICIENT: .48
TIME: 1115 HOURS
R**2: .8088

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	71.31	1.00	69.65	2.00	41.55	3.00	34.43
4.00	22.19	5.00	18.80	6.00	19.60	7.00	13.69	8.00	6.75
9.00	5.64	10.00	2.62	11.00	.73	12.00	.03		

Lake 223

DATE: 11 SEP
EXTINCTION COEFFICIENT: .59
TIME: 0920 HOURS
R**2: .7239

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	68.86	1.00	53.97	2.00	39.08	3.00	27.36
4.00	18.98	5.00	13.77	6.00	10.05	7.00	7.35	8.00	5.58
9.00	4.02	10.00	1.81	11.00	.42	12.00	.00		

DATE: 25 SEP
EXTINCTION COEFFICIENT: .57
TIME: 1605 HOURS
R**2: .8682

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	68.60	1.00	52.64	2.00	28.71	3.00	17.07
4.00	10.37	5.00	6.54	6.00	4.18	7.00	2.78	8.00	1.83
9.00	1.21	10.00	.82	11.00	.55	12.00	.35	13.00	.00

DATE: 13 OCT
EXTINCTION COEFFICIENT: .46
TIME: 1005 HOURS
R**2: .9907

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	68.04	1.00	51.55	2.00	26.80	3.00	15.05
4.00	9.07	5.00	5.88	6.00	3.71	7.00	2.41	8.00	1.61
9.00	1.06	10.00	.73	11.00	.52	12.00	.35	13.00	.24

DATE: 27 OCT
EXTINCTION COEFFICIENT: .47
TIME: 1420 HOURS
R**2: .9915

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	69.68	1.00	47.17	2.00	23.58	3.00	14.58
4.00	8.79	5.00	5.36	6.00	3.34	7.00	2.17	8.00	1.44
9.00	.94	10.00	.63	11.00	.43	12.00	.29	13.00	.19

Lake 226 NE

DATE: 29 APR
EXTINCTION COEFFICIENT: .80
TIME: 1620 HOURS
R**2: .9966

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	62.13	1.00	46.29	2.00	24.36	3.00	11.69
4.00	5.12	5.00	2.30	6.00	.96	7.00	.38	8.00	.1[illegible]

DATE: 13 MAY
EXTINCTION COEFFICIENT: .72
TIME: 0855 HOURS
R**2: .9985

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	58.41	1.00	37.79	2.00	17.87	3.00	9.04
4.00	4.74	5.00	2.25	6.00	1.07	7.00	.55	8.00	.27

DATE: 22 MAY
EXTINCTION COEFFICIENT: .77
TIME: 0930 HOURS
R**2: .9942

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	61.75	1.00	45.98	2.00	23.65	3.00	12.74
4.00	6.63	5.00	3.18	6.00	1.27	7.00	.48	8.00	.19
9.00	.09								

DATE: 5 JUN
EXTINCTION COEFFICIENT: .75
TIME: 0810 HOURS
R**2: .9935

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	50.25	1.00	31.53	2.00	14.98	3.00	8.28
4.00	4.29	5.00	2.17	6.00	.98	7.00	.35		

DATE: 16 JUN
EXTINCTION COEFFICIENT: .86
TIME: 0830 HOURS
R**2: .9971

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SUPF.
0.00	100.00	.50	56.75	1.00	36.26	2.00	14.50	3.00	6.70
4.00	3.37	5.00	1.47	6.00	.57	7.00	.19		

DATE: 3 JUL
EXTINCTION COEFFICIENT: 1.08
TIME: 0825 HOURS
R**2: .9956

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	48.29	1.00	26.43	2.00	9.57	3.00	3.90
4.00	1.59	5.00	.34	6.00	.13				

DATE: 24 JUL
EXTINCTION COEFFICIENT: 1.13
TIME: 0943 HOURS
R**2: .9983

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	47.96	1.00	28.00	2.00	9.97	3.00	3.79
4.00	1.10	5.00	.31	6.00	.10				

DATE: 7 AUG
EXTINCTION COEFFICIENT: 1.12
TIME: 0925 HOURS
R**2: .9976

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	47.02	1.00	24.51	2.00	7.20	3.00	2.55
4.00	1.00	5.00	.30	6.00	.10				

DATE: 21 AUG
EXTINCTION COEFFICIENT: 1.04
TIME: 0907 HOURS
R**2: .9901

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	43.97	1.00	23.03	2.00	6.83	3.00	2.37
4.00	.97	5.00	.41	6.00	.18				

DATE: 8 SEP
EXTINCTION COEFFICIENT: .88
TIME: 0900 HOURS
R**2: .9980

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	51.83	1.00	31.56	2.00	13.72	3.00	6.01
4.00	2.71	5.00	1.15	6.00	.48	7.00	.16		

Lake 226 NE

DATE: 22 SEP TIME: 1045 HOURS
EXTINCTION COEFFICIENT: .88 R**2: .9971

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	52.54	1.00	31.38	2.00	12.69	3.00	5.78
4.00	2.75	5.00	1.20	6.00	.47	7.00	.16		

DATE: 2 OCT TIME: 1405 HOURS
EXTINCTION COEFFICIENT: .74 R**2: .9981

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	58.26	1.00	37.87	2.00	16.90	3.00	8.21
4.00	3.85	5.00	1.96	6.00	1.01	7.00	.48	8.00	.23

DATE: 20 OCT TIME: 1030 HOURS
EXTINCTION COEFFICIENT: .75 R**2: .9956

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	52.58	1.00	31.89	2.00	13.99	3.00	6.95
4.00	3.55	5.00	1.80	6.00	.92	7.00	.46	8.00	.19

Lake 226 SW

DATE: 29 APR
EXTINCTION COEFFICIENT: .87
TIME: 1605 HOURS
R**2: .9992

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	58.07	1.00	37.97	2.00	18.20	3.00	7.93
4.00	2.99	5.00	1.25	6.00	.52	7.00	.21		

DATE: 13 MAY
EXTINCTION COEFFICIENT: .61
TIME: 0835 HOURS
R**2: .9959

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	58.33	1.00	37.05	2.00	18.33	3.00	10.52
4.00	6.19	5.00	3.47	6.00	1.89	7.00	1.06	8.00	.58
9.00	.31								

DATE: 22 MAY
EXTINCTION COEFFICIENT: .66
TIME: 0920 HOURS
R**2: .9993

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.71	1.00	46.38	2.00	23.19	3.00	12.50
4.00	6.44	5.00	3.45	6.00	1.86	7.00	.98	8.00	.46
9.00	.22								

DATE: 5 JUN
EXTINCTION COEFFICIENT: .61
TIME: 0755 HOURS
R**2: .9987

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	64.52	1.00	43.01	2.00	23.99	3.00	13.90
4.00	8.02	5.00	4.38	6.00	2.44	7.00	1.32	8.00	.68
9.00	.36								

DATE: 16 JUN
EXTINCTION COEFFICIENT: .69
TIME: 0815 HOURS
R**2: .9977

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	61.99	1.00	42.84	2.00	21.70	3.00	11.76
4.00	6.29	5.00	3.34	6.00	1.62	7.00	.74	8.00	.31

DATE: 3 JUL
EXTINCTION COEFFICIENT: .71
TIME: 0830 HOURS
R**2: .9926

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	60.45	1.00	44.33	2.00	20.96	3.00	10.88
4.00	6.13	5.00	3.30	6.00	1.76	7.00	.86	8.00	.31
9.00	.11								

DATE: 24 JUL
EXTINCTION COEFFICIENT: .70
TIME: 0915 HOURS
R**2: .9982

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	60.23	1.00	39.87	2.00	21.01	3.00	10.60
4.00	5.33	5.00	2.65	6.00	1.49	7.00	.75	8.00	.30

DATE: 7 AUG
EXTINCTION COEFFICIENT: .73
TIME: 0915 HOURS
R**2: .9983

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	61.99	1.00	38.24	2.00	17.72	3.00	8.88
4.00	4.55	5.00	2.22	6.00	1.17	7.00	.56	8.00	.26

DATE: 21 AUG
EXTINCTION COEFFICIENT: .76
TIME: 0900 HOURS
R**2: .9918

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	53.02	1.00	32.92	2.00	13.54	3.00	6.51
4.00	3.01	5.00	1.38	6.00	.67	7.00	.40	8.00	.23

Lake 226 SW

DATE: 8 SEP
EXTINCTION COEFFICIENT: .71
TIME: 0835 HOURS
R**2: .9969

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	54.44	1.00	34.46	2.00	17.74	3.00	8.43
4.00	4.12	5.00	2.12	6.00	1.06	7.00	.55	8.00	.30

DATE: 22 SEP
EXTINCTION COEFFICIENT: .70
TIME: 1025 HOURS
R**2: .9968

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	58.52	1.00	36.37	2.00	17.83	3.00	9.13
4.00	5.20	5.00	2.68	6.00	1.40	7.00	.63	8.00	.27

DATE: 2 OCT
EXTINCTION COEFFICIENT: .76
TIME: 1430 HOURS
R**2: .9976

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	63.35	1.00	41.42	2.00	16.45	3.00	7.80
4.00	3.65	5.00	1.86	6.00	.95	7.00	.48	8.00	.19

DATE: 20 OCT
EXTINCTION COEFFICIENT: .74
TIME: 1015 HOURS
R**2: .9944

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	50.98	1.00	28.94	2.00	13.21	3.00	6.99
4.00	3.64	5.00	1.90	6.00	.91	7.00	.44	8.00	.17

Lake 227

DATE: 29 APR TIME: 1500 HOURS
EXTINCTION COEFFICIENT: 1.13 R**2: .9995

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	51.54	1.00	28.11	2.00	8.81	3.00	2.81
4.00	.97	5.00	.32	6.00	.11				

DATE: 15 MAY TIME: 0910 HOURS
EXTINCTION COEFFICIENT: 1.57 R**2: .9968

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	34.79	1.00	14.43	2.00	3.48	3.00	.68
4.00	.17								

DATE: 3 JUN TIME: 1355 HOURS
EXTINCTION COEFFICIENT: 1.92 R**2: .9925

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	45.45	1.00	20.53	2.00	4.31	3.00	.39
4.00	.05								

DATE: 18 JUN TIME: 1500 HOURS
EXTINCTION COEFFICIENT: 2.17 R**2: .9886

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	35.79	1.00	15.65	2.00	2.95	3.00	.23
4.00	.01								

DATE: 30 JUN TIME: 1000 HOURS
EXTINCTION COEFFICIENT: 2.26 R**2: .9960

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	27.82	1.00	9.82	2.00	1.40	3.00	.10

DATE: 9 JUL TIME: 0835 HOURS
EXTINCTION COEFFICIENT: 2.48 R**2: .9971

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	24.65	1.00	7.88	2.00	.87	3.00	.05

DATE: 21 JUL TIME: 1015 HOURS
EXTINCTION COEFFICIENT: 2.46 R**2: .9965

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	22.47	1.00	7.32	2.00	.86	3.00	.05

DATE: 4 AUG TIME: 1030 HOURS
EXTINCTION COEFFICIENT: 2.31 R**2: .9934

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	22.97	1.00	8.21	2.00	1.24	3.00	.07

DATE: 15 AUG TIME: 1530 HOURS
EXTINCTION COEFFICIENT: 2.34 R**2: .9970

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	28.07	1.00	9.78	2.00	1.36	3.00	.10
4.00	.01								

DATE: 1 SEP TIME: 1025 HOURS
EXTINCTION COEFFICIENT: 2.06 R**2: .9933

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	23.65	1.00	7.69	2.00	1.14	3.00	.18

DATE: 15 SEP TIME: 1010 HOURS
EXTINCTION COEFFICIENT: 2.06 R**2: .9712

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	17.78	1.00	4.85	2.00	.71	3.00	.18

Lake 227

DATE: 2 OCT TIME: 1330 HOURS
EXTINCTION COEFFICIENT: 2.63 R**2: .9932

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	15.76	1.00	3.97	2.00	.32	3.00	.03

DATE: 13 OCT TIME: 0900 HOURS
EXTINCTION COEFFICIENT: 2.50 R**2: .9896

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	17.20	1.00	3.96	2.00	.38	3.00	.05

DATE: 27 OCT TIME: 1055 HOURS
EXTINCTION COEFFICIENT: 2.21 R**2: .9683

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	16.94	1.00	4.77	2.00	1.62	3.00	.07

Lake 239

DATE: 29 APR
EXTINCTION COEFFICIENT: .72
TIME: 1725 HOURS
R**2: .9930

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	55.97	1.00	33.92	2.00	14.93	3.00	6.95
4.00	3.56	5.00	1.80	6.00	.97	7.00	.52	8.00	.29

DATE: 15 MAY
EXTINCTION COEFFICIENT: .64
TIME: 1335 HOURS
R**2: .9965

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	61.66	1.00	41.93	2.00	18.50	3.00	10.69
4.00	5.67	5.00	2.88	6.00	1.55	7.00	.84	8.00	.49
9.00	.28								

DATE: 3 JUN
EXTINCTION COEFFICIENT: .68
TIME: 0945 HOURS
R**2: .9986

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.98	1.00	43.65	2.00	19.80	3.00	11.17
4.00	6.40	5.00	2.79	6.00	1.39	7.00	.69	8.00	.36
9.00	.19	10.00	.11						

DATE: 16 JUN
EXTINCTION COEFFICIENT: .66
TIME: 1050 HOURS
R**2: .9991

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	62.72	1.00	40.87	2.00	22.33	3.00	12.35
4.00	6.65	5.00	3.42	6.00	1.81	7.00	.88	8.00	.45
9.00	.24								

DATE: 25 JUN
EXTINCTION COEFFICIENT: .73
TIME: 0840 HOURS
R**2: .9980

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	56.60	1.00	36.79	2.00	16.98	3.00	7.64
4.00	3.89	5.00	1.98	6.00	1.03	7.00	.48	8.00	.24
9.00	.12								

DATE: 7 JUL
EXTINCTION COEFFICIENT: .64
TIME: 1135 HOURS
R**2: .9986

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	63.06	1.00	44.93	2.00	22.86	3.00	11.82
4.00	7.09	5.00	4.18	6.00	2.05	7.00	.95	8.00	.50
9.00	.27	10.00	.16						

DATE: 25 JUL
EXTINCTION COEFFICIENT: .65
TIME: 1355 HOURS
R**2: .9995

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.88	1.00	45.29	2.00	23.47	3.00	12.35
4.00	6.71	5.00	3.71	6.00	1.94	7.00	.93	8.00	.48
9.00	.26	10.00	.15						

DATE: 11 AUG
EXTINCTION COEFFICIENT: .75
TIME: 0810 HOURS
R**2: .9971

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	56.02	1.00	33.39	2.00	15.60	3.00	7.36
4.00	3.65	5.00	1.87	6.00	.89	7.00	.43	8.00	.22

DATE: 25 AUG
EXTINCTION COEFFICIENT: .63
TIME: 1350 HOURS
R**2: .9954

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	53.36	1.00	35.58	2.00	17.49	3.00	9.34
4.00	5.48	5.00	3.14	6.00	1.78	7.00	.92	8.00	.49
9.00	.27								

Lake 239

DATE: 10 SEP — TIME: 1105 HOURS
EXTINCTION COEFFICIENT: .67 — R**2: .9981

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	57.59	1.00	37.65	2.00	18.83	3.00	9.75
4.00	5.20	5.00	2.68	6.00	1.36	7.00	.70	8.00	.36
9.00	.20	10.00	.11						

DATE: 17 SEP — TIME: 1040 HOURS
EXTINCTION COEFFICIENT: .62 — R**2: .9919

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	56.53	1.00	32.24	2.00	16.33	3.00	8.79
4.00	5.03	5.00	2.81	6.00	1.59	7.00	.92	8.00	.50
9.00	.30								

DATE: 18 SEP — TIME: 1645 HOURS
EXTINCTION COEFFICIENT: .70 — R**2: .9948

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	53.96	1.00	33.28	2.00	14.21	3.00	6.83
4.00	3.51	5.00	1.74	6.00	.91	7.00	.47	8.00	.25
9.00	.13	10.00	.07						

DATE: 5 OCT — TIME: 1600 HOURS
EXTINCTION COEFFICIENT: .71 — R**2: .9934

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	51.81	1.00	30.37	2.00	13.22	3.00	6.61
4.00	3.31	5.00	1.68	6.00	.88	7.00	.46	8.00	.25
9.00	.13								

DATE: 6 OCT — TIME: 1100 HOURS
EXTINCTION COEFFICIENT: .70 — R**2: .9959

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	61.17	1.00	37.87	2.00	17.48	3.00	8.30
4.00	4.15	5.00	2.11	6.00	1.12	7.00	.58	8.00	.32
9.00	.18								

DATE: 7 OCT — TIME: 1645 HOURS
EXTINCTION COEFFICIENT: .70 — R**2: .9923

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	54.13	1.00	31.73	2.00	14.47	3.00	6.91
4.00	3.41	5.00	1.82	6.00	.93	7.00	.52	8.00	.29
9.00	.16								

DATE: 21 OCT — TIME: 1100 HOURS
EXTINCTION COEFFICIENT: .72 — R**2: .9971

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	56.28	1.00	37.52	2.00	16.44	3.00	7.68
4.00	3.84	5.00	1.95	6.00	.98	7.00	.53	8.00	.27
9.00	.13								

DATE: 28 OCT — TIME: 0905 HOURS
EXTINCTION COEFFICIENT: .71 — R**2: .9944

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	56.09	1.00	37.40	2.00	17.45	3.00	7.01
4.00	3.55	5.00	1.68	6.00	.86	7.00	.45	8.00	.25
9.00	.14	10.00	.08						

Lake 302 N

DATE: 4 JUN TIME: 0850 HOURS
EXTINCTION COEFFICIENT: .67 R**2: .9907

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	68.72	1.00	46.96	2.00	26.11	3.00	16.49
4.00	9.39	5.00	5.41	6.00	2.59	7.00	.95	8.00	.41
9.00	.22								

DATE: 16 JUN TIME: 0930 HOURS
EXTINCTION COEFFICIENT: .65 R**2: .9928

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	74.18	1.00	52.64	2.00	32.30	3.00	18.54
4.00	11.01	5.00	5.74	6.00	2.85	7.00	1.36	8.00	.63
9.00	.31	10.00	.12						

DATE: 27 JUN TIME: 0930 HOURS
EXTINCTION COEFFICIENT: .65 R**2: .9773

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.85	1.00	50.36	2.00	33.57	3.00	21.31
4.00	13.56	5.00	7.88	6.00	3.81	7.00	1.47	8.00	.70
9.00	.30	10.00	.10						

DATE: 10 JUL TIME: 0935 HOURS
EXTINCTION COEFFICIENT: .63 R**2: .9838

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	74.20	1.00	53.01	2.00	31.25	3.00	19.08
4.00	11.59	5.00	6.51	6.00	3.50	7.00	1.85	8.00	.97
9.00	.44	10.00	.11						

DATE: 29 JUL TIME: 0805 HOURS
EXTINCTION COEFFICIENT: .67 R**2: .9950

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	62.68	1.00	44.31	2.00	22.69	3.00	13.18
4.00	7.67	5.00	4.41	6.00	2.00	7.00	.94	8.00	.49
9.00	.18								

DATE: 14 AUG TIME: 0855 HOURS
EXTINCTION COEFFICIENT: .70 R**2: .9824

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	72.55	1.00	47.97	2.00	26.12	3.00	14.44
4.00	8.71	5.00	5.00	6.00	2.42	7.00	1.02	8.00	.44
9.00	.11								

DATE: 22 SEP TIME: 1635 HOURS
EXTINCTION COEFFICIENT: .72 R**2: .9681

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	56.95	1.00	40.20	2.00	20.10	3.00	10.39
4.00	5.53	5.00	3.10	6.00	1.71	7.00	.96	8.00	.55
9.00	.19	10.00	.02						

DATE: 20 OCT TIME: 0850 HOURS
EXTINCTION COEFFICIENT: .60 R**2: .9939

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	57.69	1.00	35.36	2.00	17.49	3.00	10.42
4.00	5.96	5.00	3.39	6.00	1.90	7.00	1.12	8.00	.63
9.00	.35								

DATE: 27 OCT TIME: 1505 HOURS
EXTINCTION COEFFICIENT: .71 R**2: .9875

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	70.72	1.00	42.19	2.00	16.63	3.00	6.70
4.00	3.10	5.00	1.79	6.00	.99	7.00	.56	8.00	.32
9.00	.18								

Lake 302 S

DATE: 4 JUN
EXTINCTION COEFFICIENT: .55
TIME: 0905 HOURS
R**2: .9741

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	71.06	1.00	53.80	2.00	33.30	3.00	22.33
4.00	15.33	5.00	10.05	6.00	5.68	7.00	2.92	8.00	1.26
9.00	.43								

DATE: 16 JUN
EXTINCTION COEFFICIENT: .60
TIME: 0945 HOURS
R**2: .9520

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	79.34	1.00	62.30	2.00	39.96	3.00	26.09
4.00	16.93	5.00	10.81	6.00	6.35	7.00	3.06	8.00	1.01
9.00	.26								

DATE: 27 JUN
EXTINCTION COEFFICIENT: .72
TIME: 0945 HOURS
R**2: .9110

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	61.52	1.00	50.39	2.00	31.05	3.00	21.09
4.00	14.65	5.00	9.37	6.00	5.39	7.00	2.52	8.00	.76
9.00	.12	10.00	.02						

DATE: 10 JUL
EXTINCTION COEFFICIENT: .70
TIME: 0920 HOURS
R**2: .9096

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	75.34	1.00	56.36	2.00	32.21	3.00	20.24
4.00	13.23	5.00	8.07	6.00	4.46	7.00	2.12	8.00	.69
9.00	.05								

DATE: 29 JUL
EXTINCTION COEFFICIENT: .75
TIME: 0820 HOURS
R**2: .9113

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.94	1.00	48.92	2.00	29.78	3.00	17.55
4.00	10.85	5.00	6.59	6.00	3.34	7.00	1.38	8.00	.48
9.00	.03								

DATE: 14 AUG
EXTINCTION COEFFICIENT: .77
TIME: 0905 HOURS
R**2: .9246

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	71.33	1.00	52.12	2.00	27.56	3.00	15.73
4.00	9.53	5.00	5.84	6.00	2.99	7.00	1.08	8.00	.42
9.00	.03								

DATE: 22 SEP
EXTINCTION COEFFICIENT: .65
TIME: 1625 HOURS
R**2: .9964

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	60.22	1.00	39.15	2.00	19.57	3.00	9.49
4.00	4.97	5.00	2.80	6.00	1.51	7.00	.84	8.00	.46
9.00	.25								

DATE: 20 OCT
EXTINCTION COEFFICIENT: .53
TIME: 0910 HOURS
R**2: .9897

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	59.70	1.00	39.27	2.00	19.64	3.00	12.21
4.00	7.62	5.00	4.27	6.00	2.89	7.00	2.02	8.00	1.11
9.00	.65								

DATE: 27 OCT
EXTINCTION COEFFICIENT: .67
TIME: 1515 HOURS
R**2: .9902

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	84.98	1.00	52.29	2.00	22.55	3.00	9.48
4.00	4.84	5.00	2.50	6.00	1.41	7.00	.85	8.00	.51
9.00	.29								

Lake 304

DATE: 18 JUN
EXTINCTION COEFFICIENT: 1.70
TIME: 1630 HOURS
R**2: .8703

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	52.64	1.00	32.54	2.00	11.10	3.00	4.02
4.00	.94	5.00	.00						

DATE: 7 JUL
EXTINCTION COEFFICIENT: 1.61
TIME: 0955 HOURS
R**2: .8986

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	50.76	1.00	28.42	2.00	9.75	3.00	3.25
4.00	.96	5.00	.01						

DATE: 11 AUG
EXTINCTION COEFFICIENT: 1.62
TIME: 0915 HOURS
R**2: .8524

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	44.18	1.00	25.64	2.00	10.43	3.00	4.13
4.00	1.30	5.00	.01						

DATE: 8 SEP
EXTINCTION COEFFICIENT: 1.15
TIME: 1030 HOURS
R**2: .9744

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	47.47	1.00	29.77	2.00	11.00	3.00	4.26
4.00	1.76	5.00	.19						

DATE: 6 OCT
EXTINCTION COEFFICIENT: 1.26
TIME: 1000 HOURS
R**2: .9924

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	37.00	1.00	17.40	2.00	4.80	3.00	1.36
4.00	.48	5.00	.16						

Lake 382

DATE: 19 MAY
EXTINCTION COEFFICIENT: .61
TIME: 0830 HOURS
R**2: .9973

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	63.65	1.00	43.55	2.00	23.45	3.00	13.74
4.00	7.71	5.00	4.77	6.00	2.65	7.00	1.38	8.00	.68
9.00	.34	10.00	.16						

DATE: 30 JUN
EXTINCTION COEFFICIENT: .60
TIME: 0845 HOURS
R**2: .9934

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	47.97	1.00	38.18	2.00	22.70	3.00	12.06
4.00	8.26	5.00	4.67	6.00	2.60	7.00	1.17	8.00	.60
9.00	.30								

DATE: 4 AUG
EXTINCTION COEFFICIENT: .54
TIME: 0915 HOURS
R**2: .9896

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	62.41	1.00	41.08	2.00	24.75	3.00	15.93
4.00	10.91	5.00	7.20	6.00	4.29	7.00	2.31	8.00	1.11
9.00	.53								

DATE: 1 SEP
EXTINCTION COEFFICIENT: .57
TIME: 0920 HOURS
R**2: .9835

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	60.39	1.00	40.58	2.00	23.59	3.00	15.29
4.00	9.81	5.00	6.40	6.00	3.90	7.00	2.07	8.00	.91
9.00	.33								

DATE: 28 SEP
EXTINCTION COEFFICIENT: .65
TIME: 1515 HOURS
R**2: .9952

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	67.00	1.00	40.81	2.00	20.10	3.00	10.60
4.00	5.30	5.00	3.14	6.00	1.67	7.00	.94	8.00	.54
9.00	.30	10.00	.10						

DATE: 27 OCT
EXTINCTION COEFFICIENT: .56
TIME: 0930 HOURS
R**2: .9953

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	65.25	1.00	41.95	2.00	24.47	3.00	13.52
4.00	7.57	5.00	4.15	6.00	2.42	7.00	1.41	8.00	.87
9.00	.57	10.00	.36						

Lake 382 Bay

DATE: 19 MAY TIME: 0850 HOURS
EXTINCTION COEFFICIENT: 1.05 R**2: .9919

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	49.33	1.00	27.13	2.00	9.70	3.00	4.11

DATE: 30 JUN TIME: 0915 HOURS
EXTINCTION COEFFICIENT: .86 R**2: .9773

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	49.58	1.00	28.23	2.00	13.72	3.00	6.84

DATE: 4 AUG TIME: 0945 HOURS
EXTINCTION COEFFICIENT: .86 R**2: .9791

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	51.40	1.00	29.52	2.00	13.36	3.00	7.08

DATE: 1 SEP TIME: 0945 HOURS
EXTINCTION COEFFICIENT: .87 R**2: .9932

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	54.53	1.00	33.89	2.00	15.11	3.00	6.93

DATE: 28 SEP TIME: 1525 HOURS
EXTINCTION COEFFICIENT: .75 R**2: .9949

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	62.63	1.00	40.05	2.00	20.39	3.00	10.27

DATE: 27 OCT TIME: 0945 HOURS
EXTINCTION COEFFICIENT: .92 R**2: .9942

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.50	50.38	1.00	34.26	2.00	14.51	3.00	5.84

Lake 661

DATE: 10 JUN
EXTINCTION COEFFICIENT: 2.79
TIME: 1140 HOURS
R**2: .9631

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.25	39.26	.50	24.75				

DATE: 25 JUL
EXTINCTION COEFFICIENT: 2.92
TIME: 1350 HOURS
R**2: .9579

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.25	62.81	.50	23.22				

DATE: 25 AUG
EXTINCTION COEFFICIENT: 2.99
TIME: 0930 HOURS
R**2: .9816

DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.25	41.45	.50	17.51	.75	11.08		

DATE: 6 OCT
EXTINCTION COEFFICIENT: 2.87
TIME: 0940 HOURS
R**2: .9141

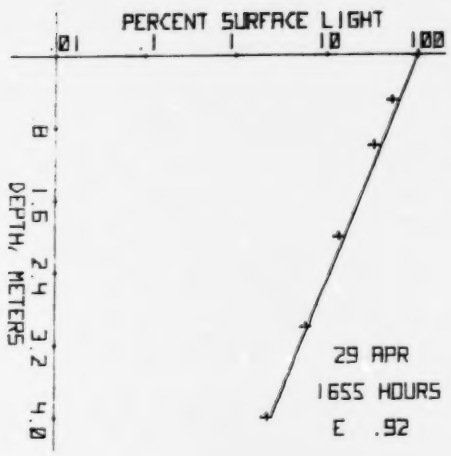
DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.	DEPTH	% SURF.
0.00	100.00	.25	33.33	.50	23.81				

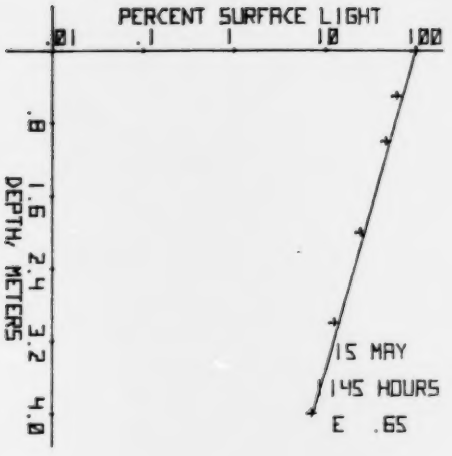
APPENDIX 2

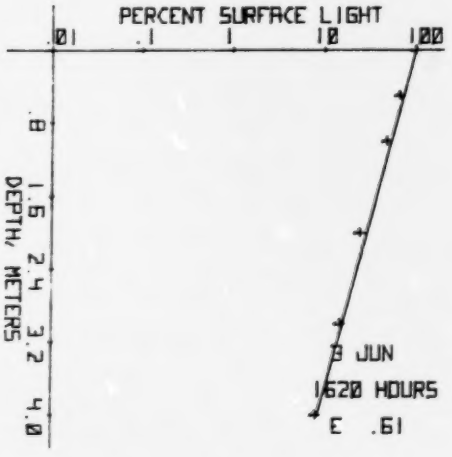
In this appendix, the measured irradiances (as percentages of surface irradiance) are plotted against depth (in meters). Percent light is plotted on a logarithmic scale, depth on a linear scale.

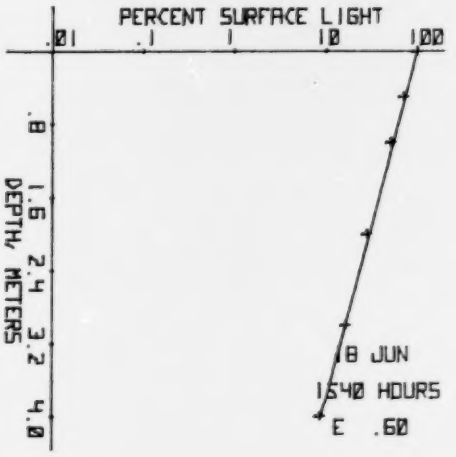
Each attenuation (or extinction) coefficient (E) is the negative slope of a regression of the natural logarithm of the percent surface light on depth. The solid line represents this regression and is an estimate of the percent surface light at depth, based on E. It has been drawn through 100% at 0 depth because this irradiance-depth relationship is fixed by definition.

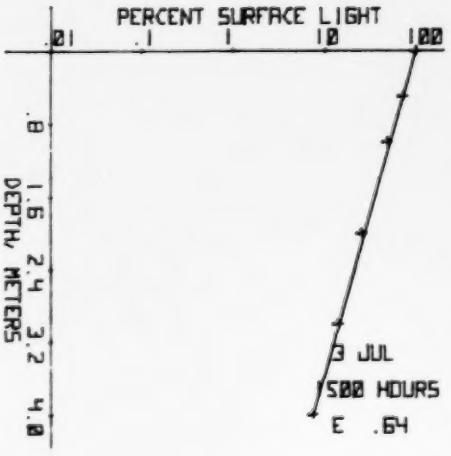
LAKE 114

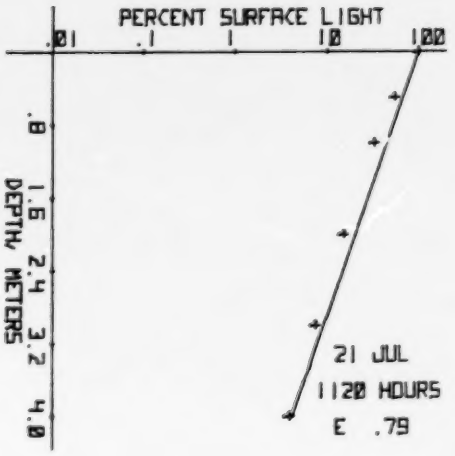

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
0
.8
1.6
2.4
3.2
4.0
29 APR
1655 HOURS
E .92


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
15 MAY
1145 HOURS
E .65

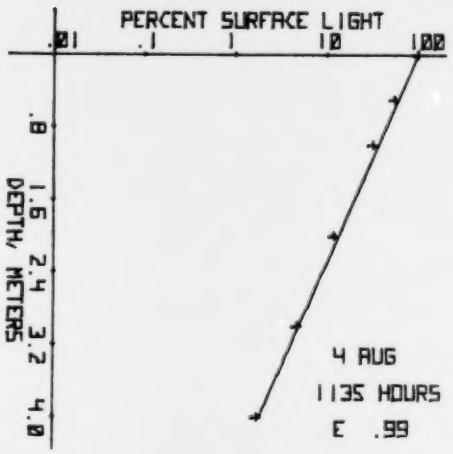

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
3 JUN
1620 HOURS
E .61

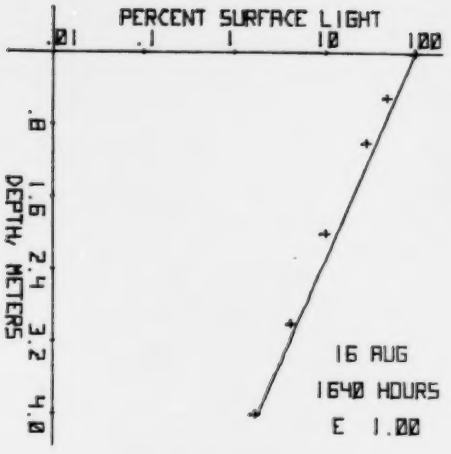

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
18 JUN
1540 HOURS
E .60

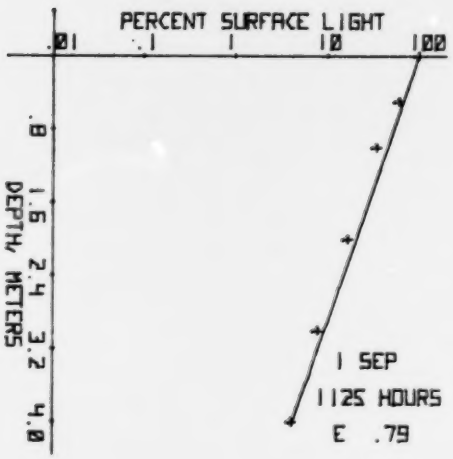

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
3 JUL
1500 HOURS
E .64

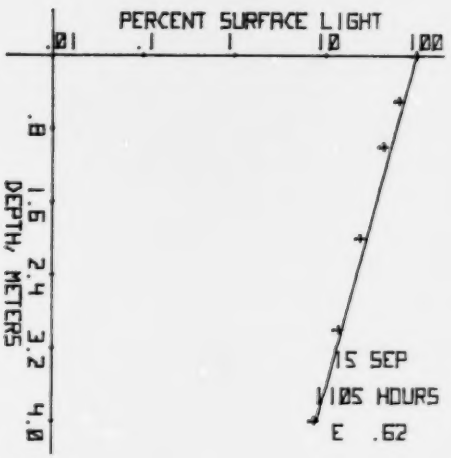

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
21 JUL
1120 HOURS
E .79

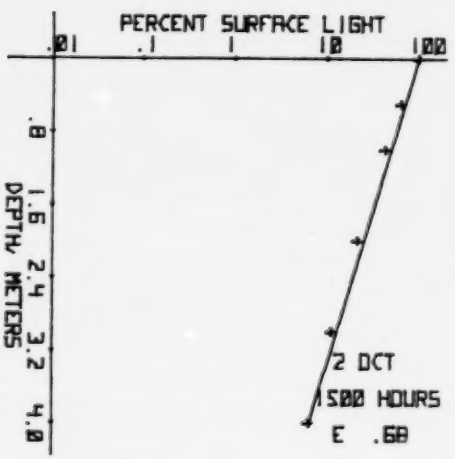
LAKE 114

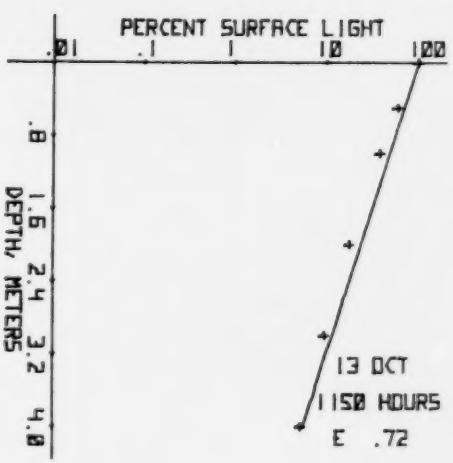

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
0 .8 1.6 2.4 3.2 4.0
4 AUG
1135 HOURS
E .99


PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
0 .8 1.6 2.4 3.2 4.0
16 AUG
1640 HOURS
E 1.00

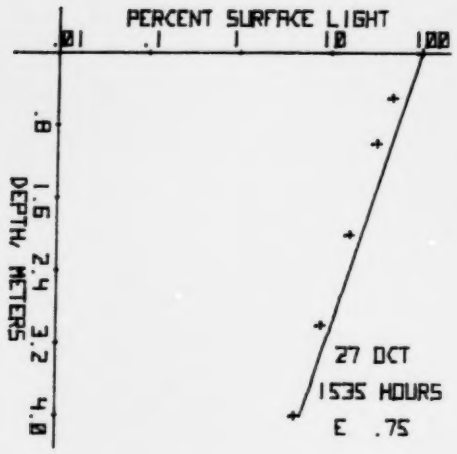

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
0 .8 1.6 2.4 3.2 4.0
1 SEP
1125 HOURS
E .79


PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
0 .8 1.6 2.4 3.2 4.0
15 SEP
1105 HOURS
E .62

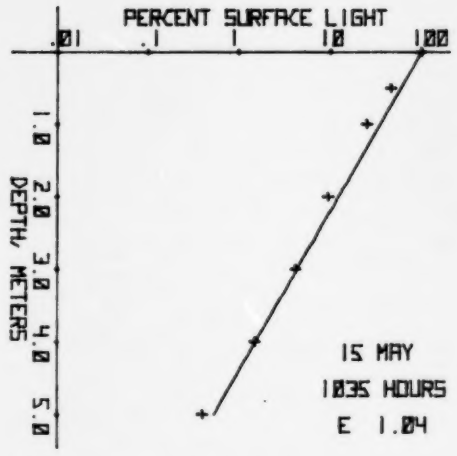

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
0 .8 1.6 2.4 3.2 4.0
2 OCT
1500 HOURS
E .68

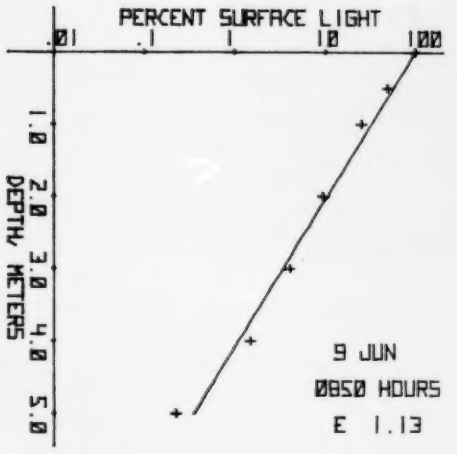

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
0 .8 1.6 2.4 3.2 4.0
13 OCT
1150 HOURS
E .72

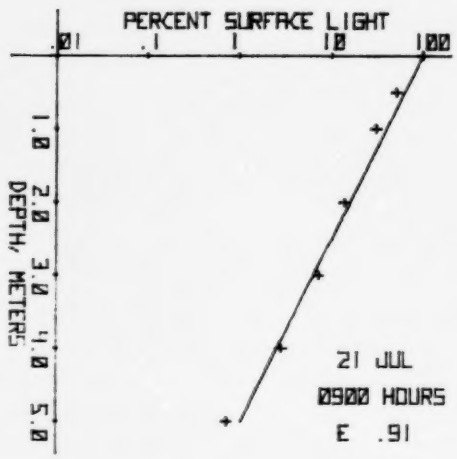
LAKE 114

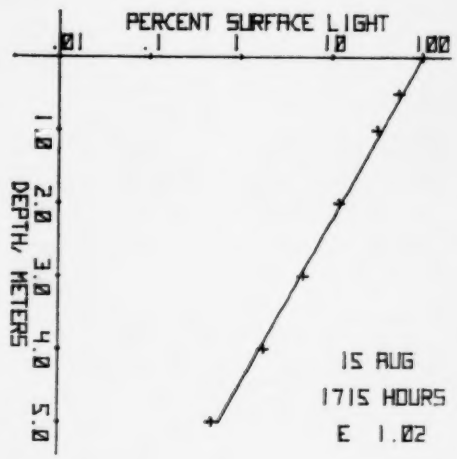

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
0
1.6
2.4
3.2
4.0
27 OCT
1535 HOURS
E .75

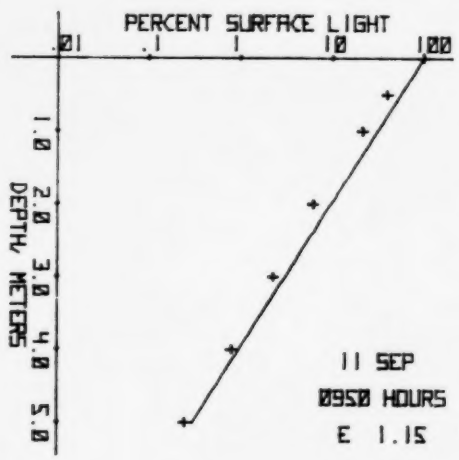
LAKE 222

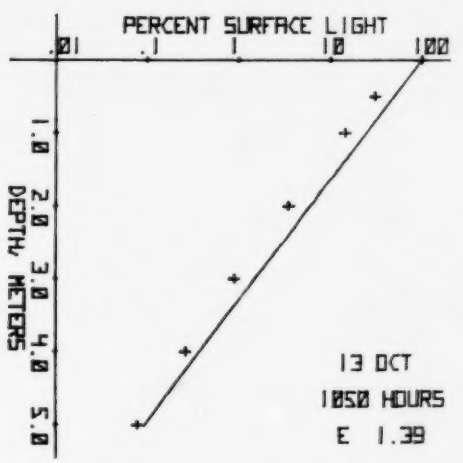

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.0
2.0
3.0
4.0
5.0
DEPTH, METERS
15 MAY
1035 HOURS
E 1.04


PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.0
2.0
3.0
4.0
5.0
DEPTH, METERS
9 JUN
0850 HOURS
E 1.13

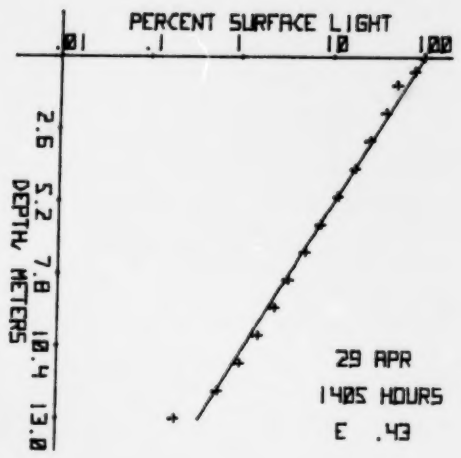

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.0
2.0
3.0
4.0
5.0
DEPTH, METERS
21 JUL
0900 HOURS
E .91

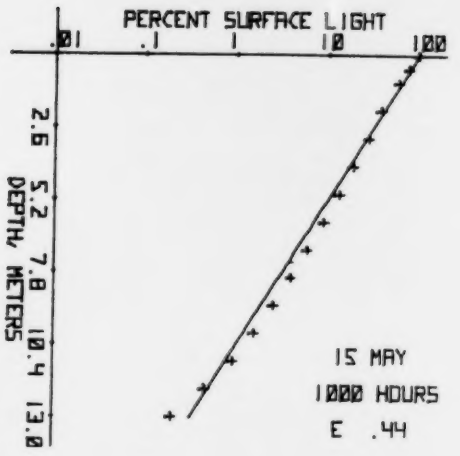

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.0
2.0
3.0
4.0
5.0
DEPTH, METERS
15 AUG
1715 HOURS
E 1.02

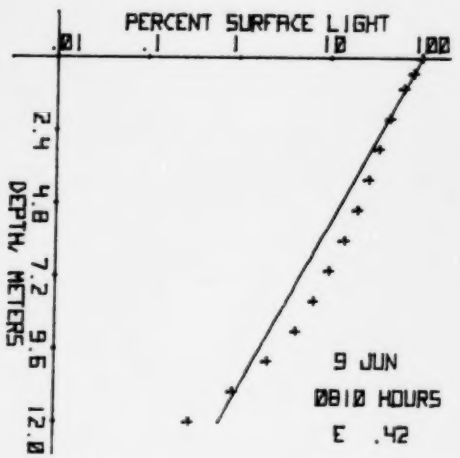

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.0
2.0
3.0
4.0
5.0
DEPTH, METERS
11 SEP
0950 HOURS
E 1.15

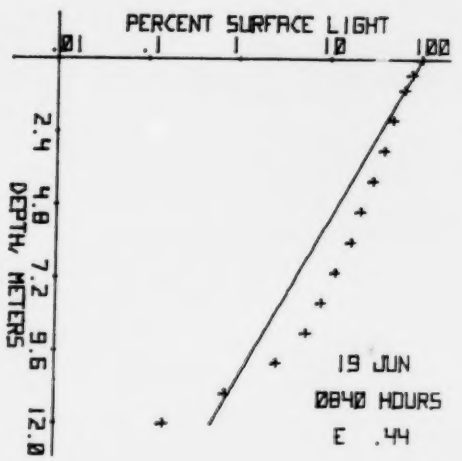

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.0
2.0
3.0
4.0
5.0
DEPTH, METERS
13 OCT
1050 HOURS
E 1.39

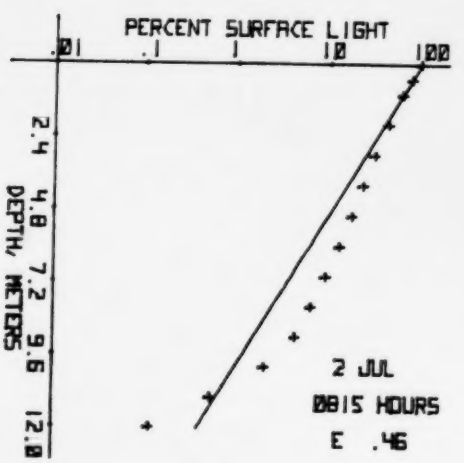
LAKE 223

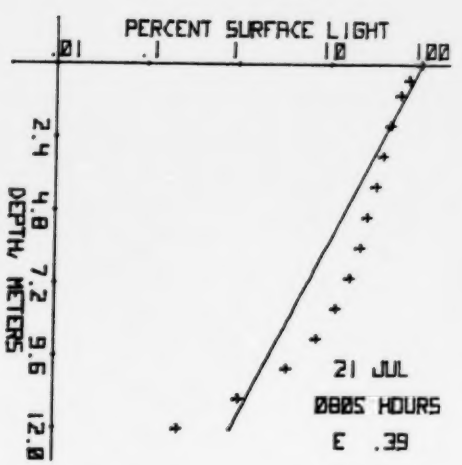

PERCENT SURFACE LIGHT
.01 .1 1 10 100
2.6 5.2 7.8 10.4 13.0
DEPTH METERS
29 APR
1405 HOURS
E .43


PERCENT SURFACE LIGHT
.01 .1 1 10 100
2.6 5.2 7.8 10.4 13.0
DEPTH METERS
15 MAY
1000 HOURS
E .44

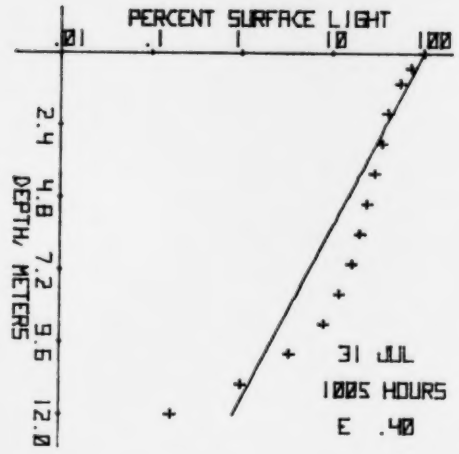

PERCENT SURFACE LIGHT
.01 .1 1 10 100
2.4 4.8 7.2 9.6 12.0
DEPTH METERS
9 JUN
0810 HOURS
E .42

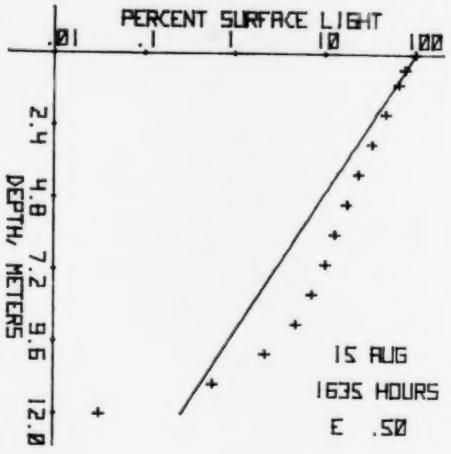

PERCENT SURFACE LIGHT
.01 .1 1 10 100
2.4 4.8 7.2 9.6 12.0
DEPTH METERS
19 JUN
0840 HOURS
E .44

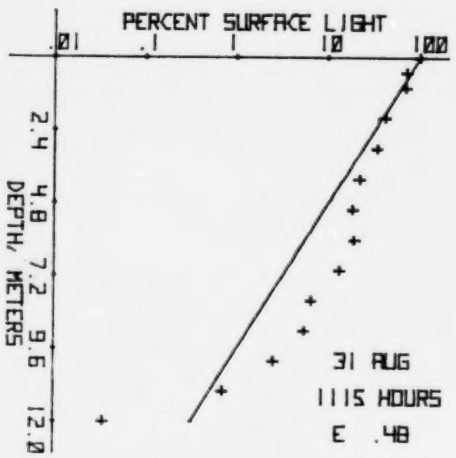

PERCENT SURFACE LIGHT
.01 .1 1 10 100
2.4 4.8 7.2 9.6 12.0
DEPTH METERS
2 JUL
0815 HOURS
E .46

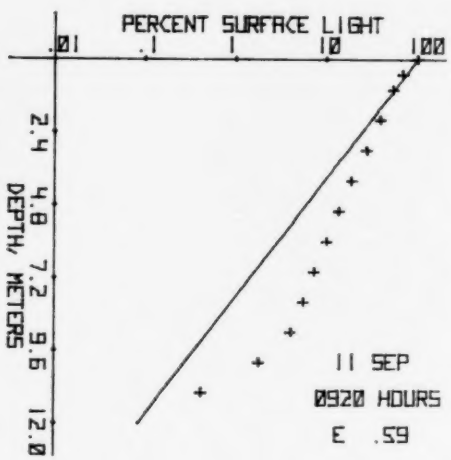

PERCENT SURFACE LIGHT
.01 .1 1 10 100
2.4 4.8 7.2 9.6 12.0
DEPTH METERS
21 JUL
0805 HOURS
E .39

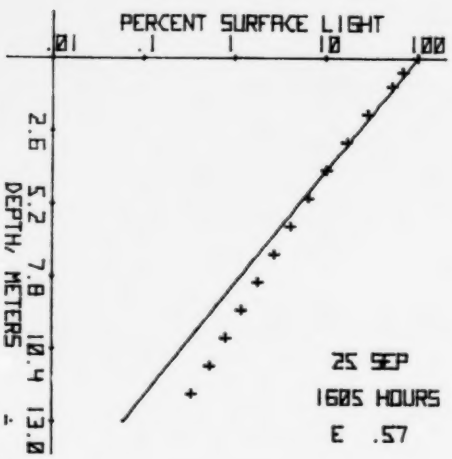
LAKE 223

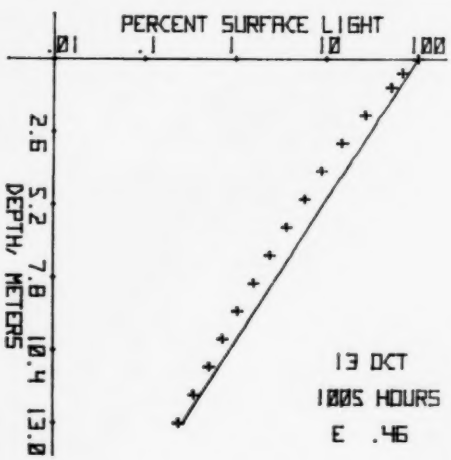

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.4
4.8
7.2
9.6
12.0
DEPTH, METERS
31 JUL
1005 HOURS
E .40


PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.4
4.8
7.2
9.6
12.0
DEPTH, METERS
15 AUG
1635 HOURS
E .50

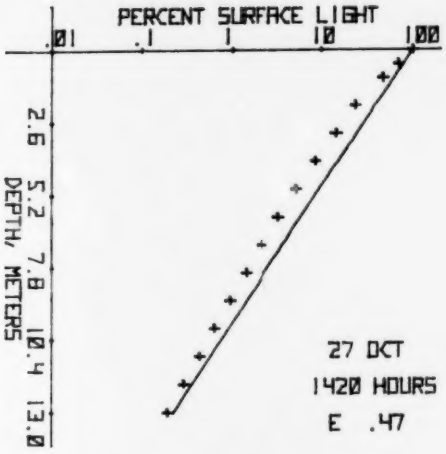

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.4
4.8
7.2
9.6
12.0
DEPTH, METERS
31 AUG
1115 HOURS
E .48


PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.4
4.8
7.2
9.6
12.0
DEPTH, METERS
11 SEP
0920 HOURS
E .59

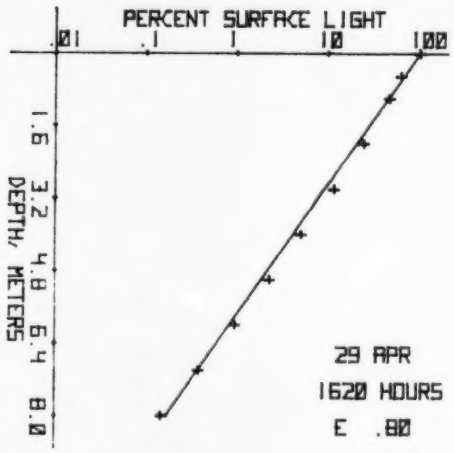

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.6
5.2
7.8
10.4
13.0
DEPTH, METERS
25 SEP
1605 HOURS
E .57

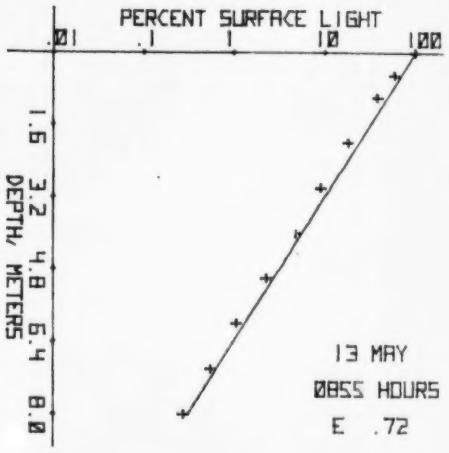

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.6
5.2
7.8
10.4
13.0
DEPTH, METERS
13 OCT
1005 HOURS
E .46

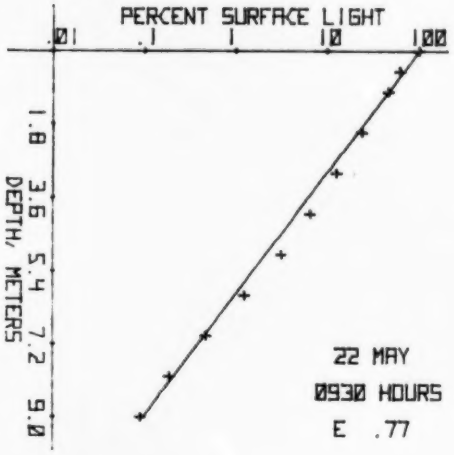
LAKE 223

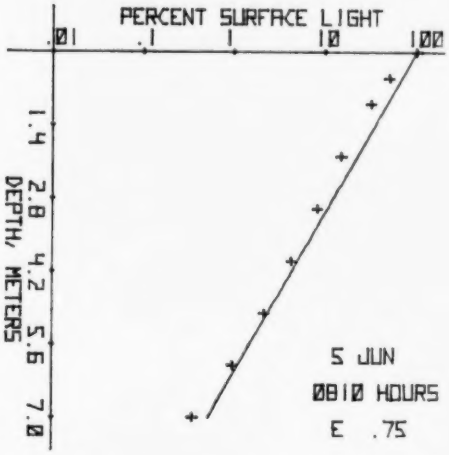

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
2.6
5.2
7.8
10.4
13.0
27 OCT
1420 HOURS
E .47

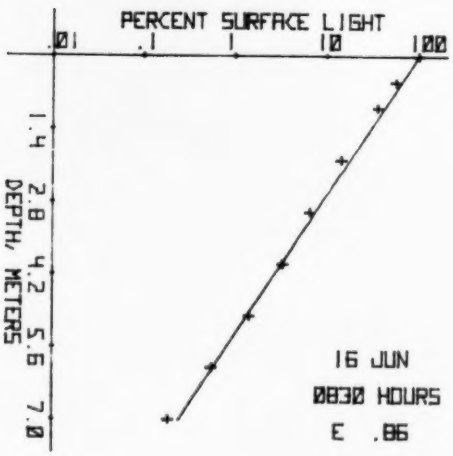
LAKE 226 NE

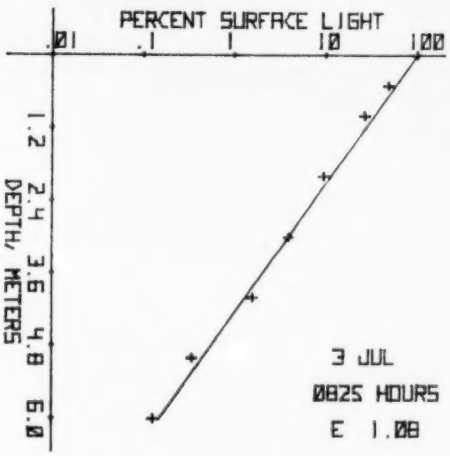

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
29 APR
1620 HOURS
E .80


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
13 MAY
0855 HOURS
E .72

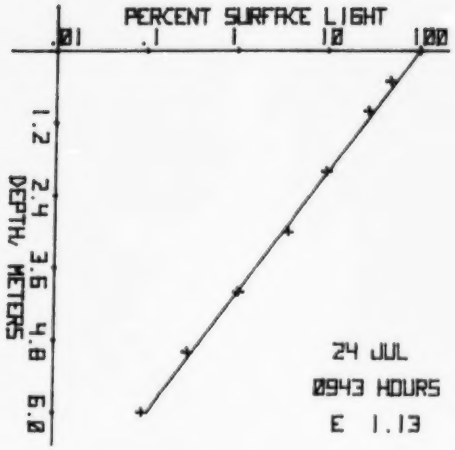

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
22 MAY
0930 HOURS
E .77

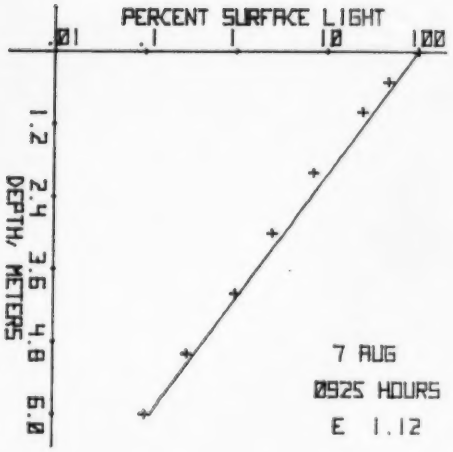

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.4
2.8
4.2
5.6
7.0
5 JUN
0810 HOURS
E .75

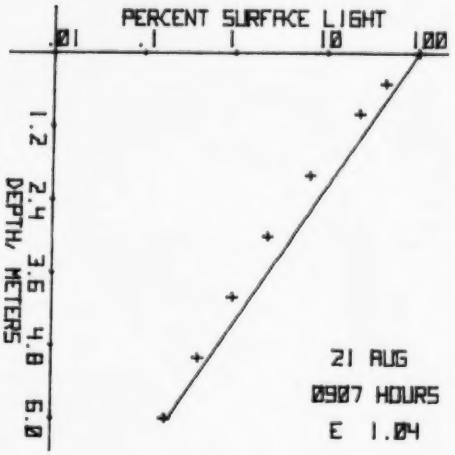

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.4
2.8
4.2
5.6
7.0
16 JUN
0830 HOURS
E .86

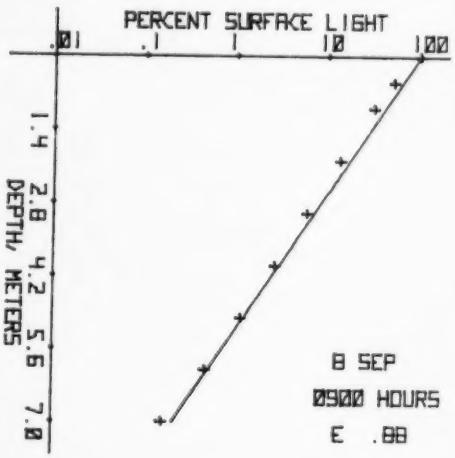

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.2
2.4
3.6
4.8
6.0
3 JUL
0825 HOURS
E 1.08

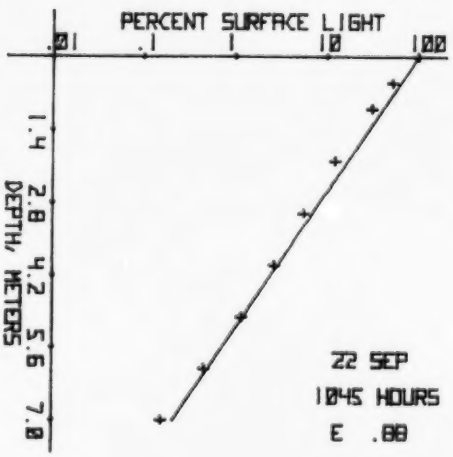
LAKE 226 NE

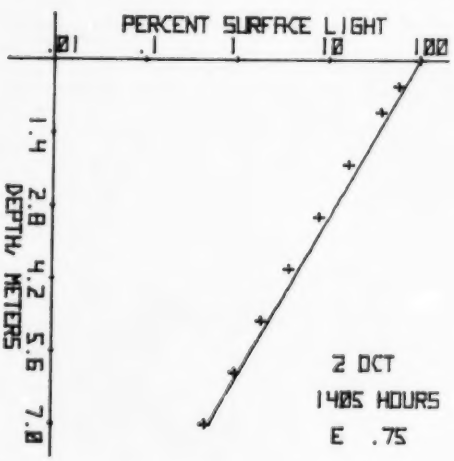

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.2 2.4 3.6 4.8 6.0
24 JUL
0943 HOURS
E 1.13


PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.2 2.4 3.6 4.8 6.0
7 AUG
0925 HOURS
E 1.12

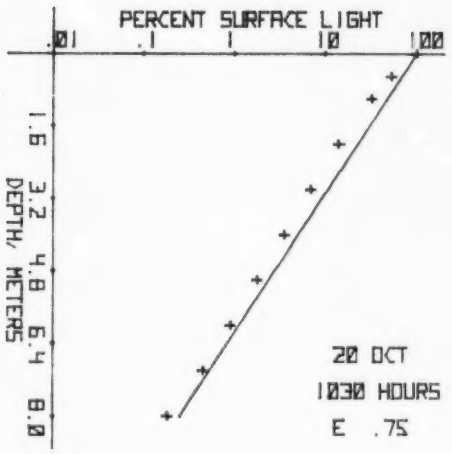

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.2 2.4 3.6 4.8 6.0
21 AUG
0907 HOURS
E 1.04


PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.4 2.8 4.2 5.6 7.0
8 SEP
0900 HOURS
E .88

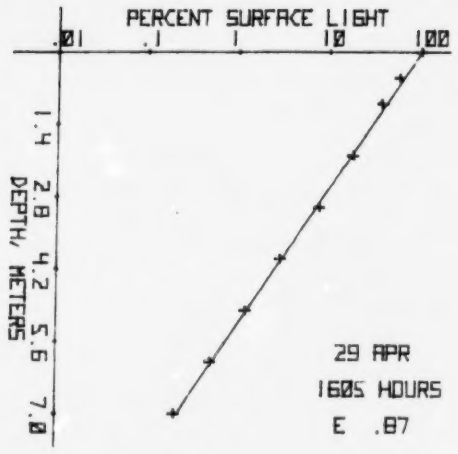

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.4 2.8 4.2 5.6 7.0
22 SEP
1045 HOURS
E .88

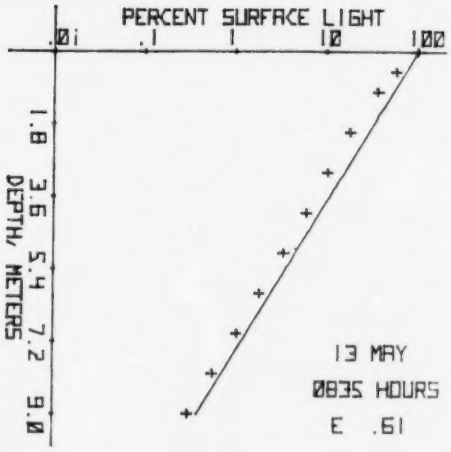

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.4 2.8 4.2 5.6 7.0
2 OCT
1405 HOURS
E .75

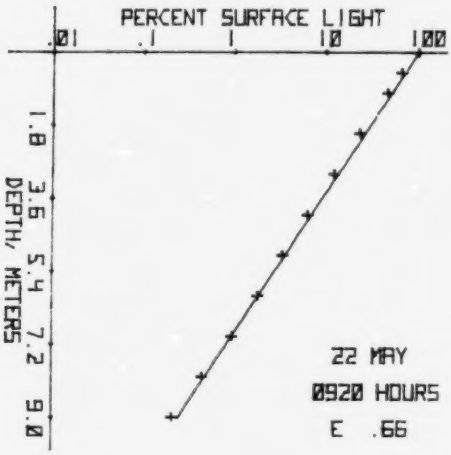
LAKE 226 NE

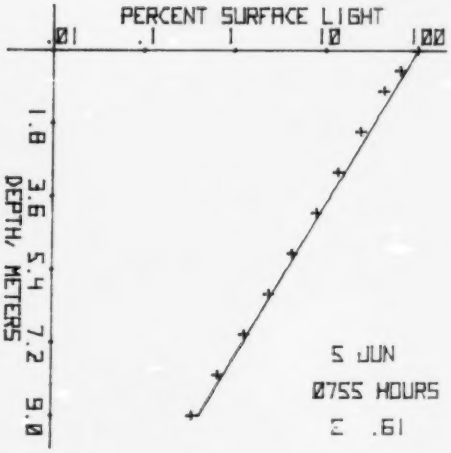

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
20 OCT
1030 HOURS
E .75

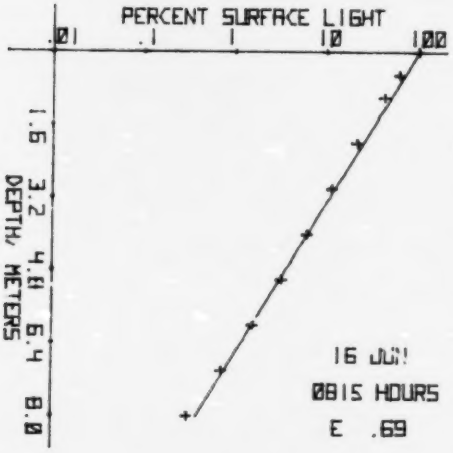
LAKE 226 SW

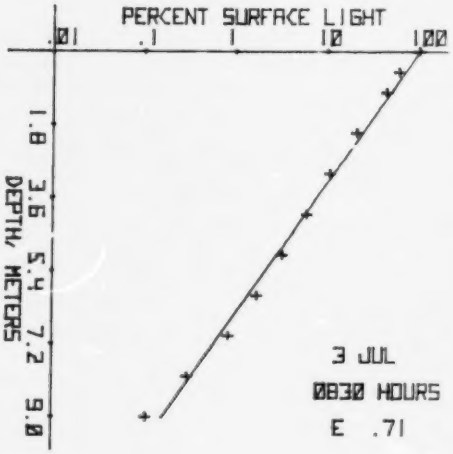

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.4
2.8
4.2
5.6
7.0
29 APR
1605 HOURS
E .87


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
13 MAY
0835 HOURS
E .61

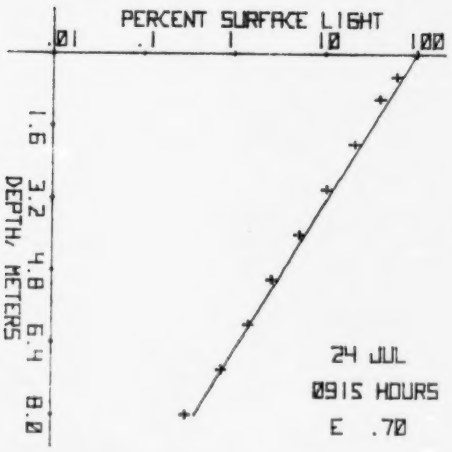

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
22 MAY
0920 HOURS
E .66

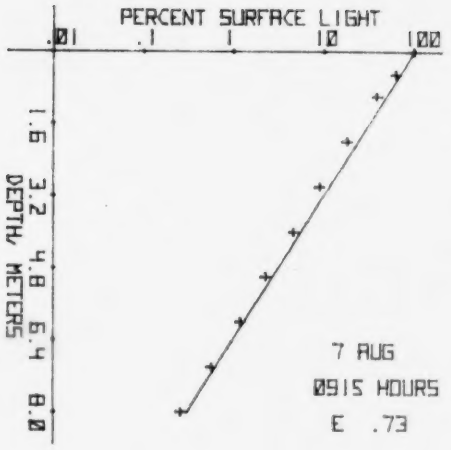

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
5 JUN
0755 HOURS
E .61

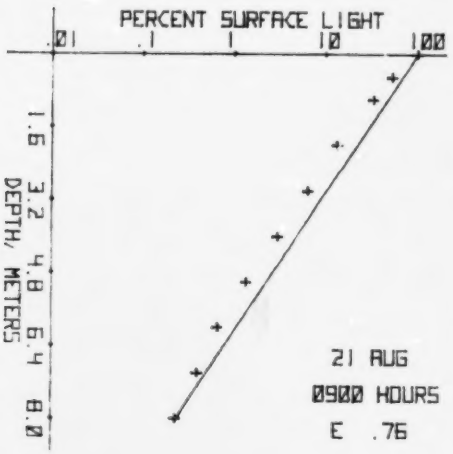

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
16 JUN
0815 HOURS
E .69

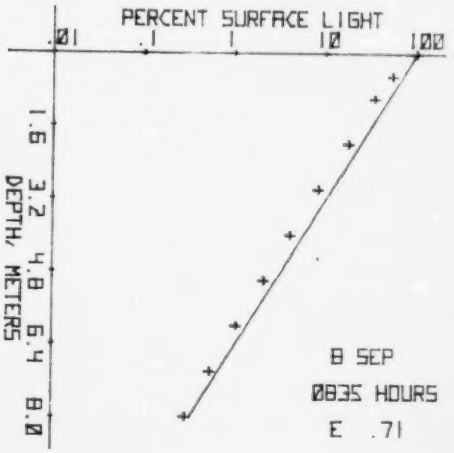

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
3 JUL
0830 HOURS
E .71

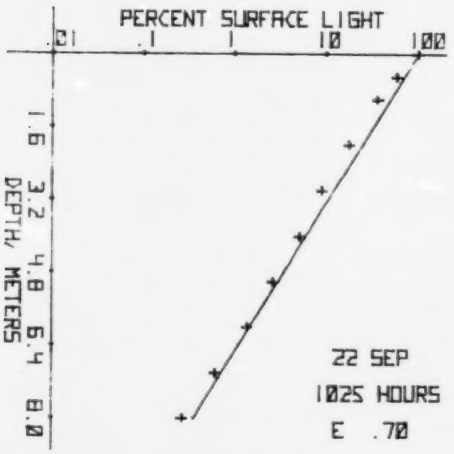
LAKE 226 SW

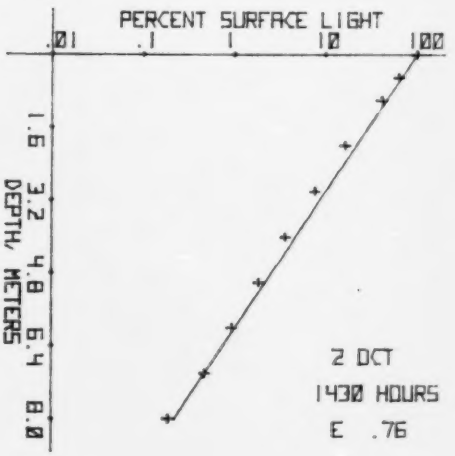

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
24 JUL
0915 HOURS
E .70


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
7 AUG
0915 HOURS
E .73

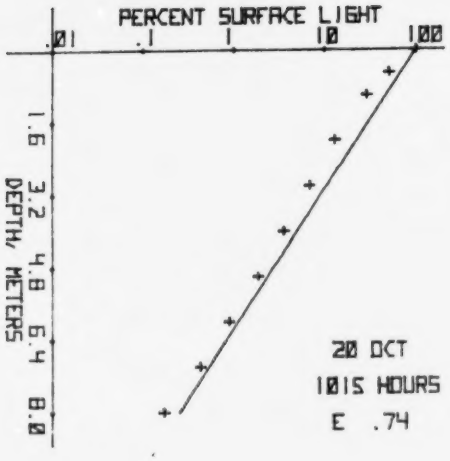

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
21 AUG
0900 HOURS
E .76


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
8 SEP
0835 HOURS
E .71

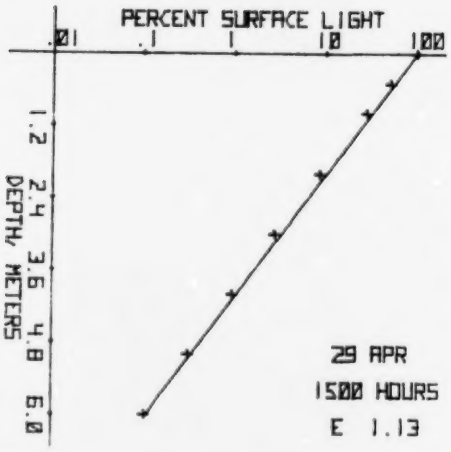

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
22 SEP
1025 HOURS
E .70

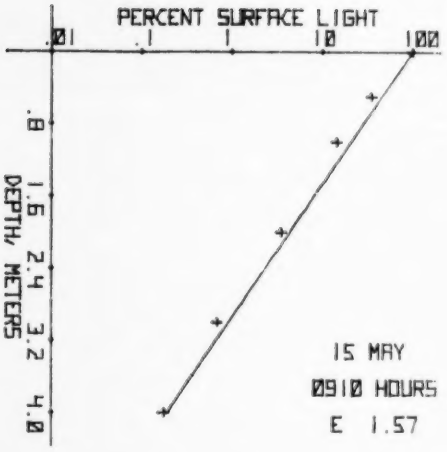

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
2 OCT
1430 HOURS
E .76

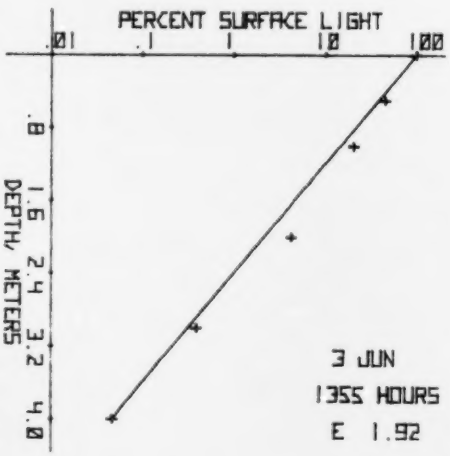
LAKE 226 SW

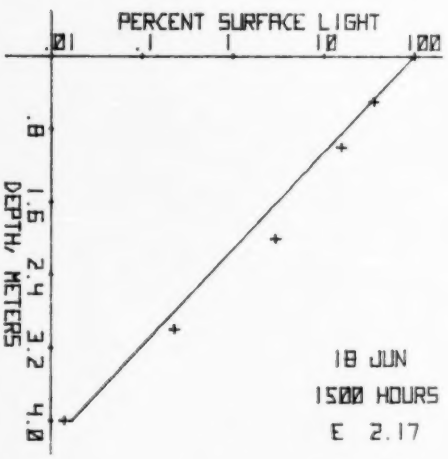

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
0.0
1.6
3.2
4.8
6.4
8.0
20 OCT
1015 HOURS
E .74

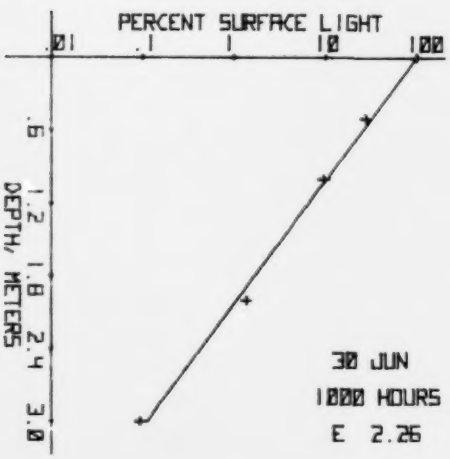
LAKE 227

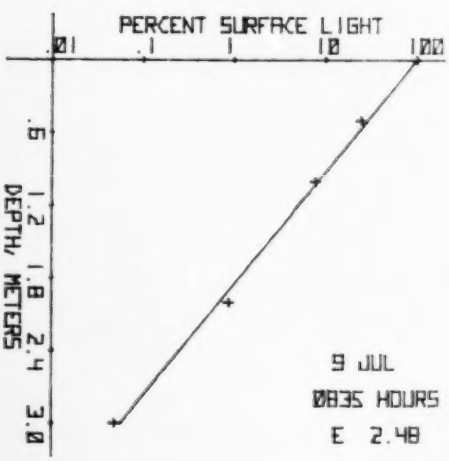

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.2
2.4
3.6
4.8
6.0
29 APR
1500 HOURS
E 1.13


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
15 MAY
0910 HOURS
E 1.57

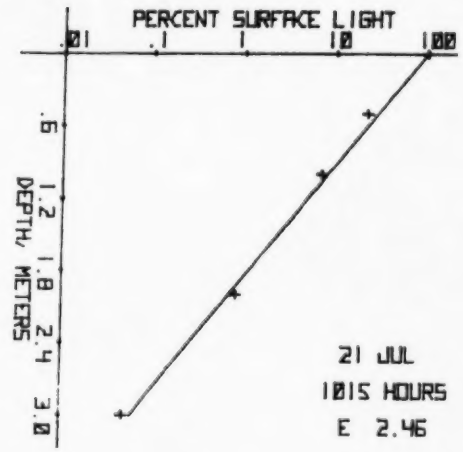

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
3 JUN
1355 HOURS
E 1.92

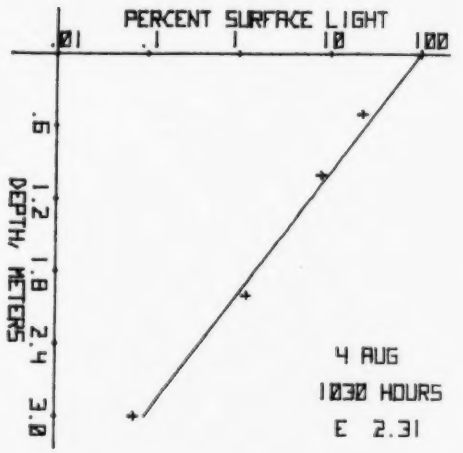

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
18 JUN
1500 HOURS
E 2.17

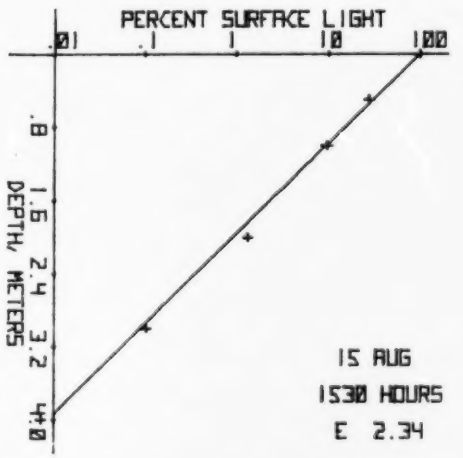

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
30 JUN
1000 HOURS
E 2.26

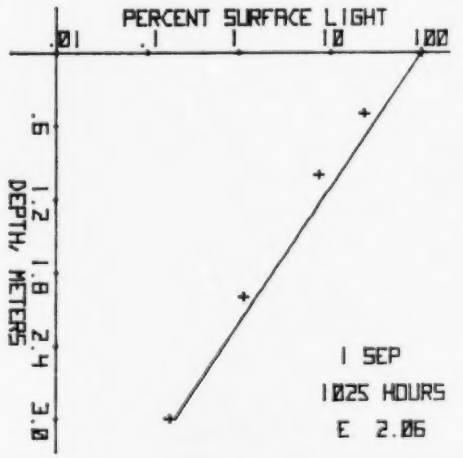

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
9 JUL
0835 HOURS
E 2.48

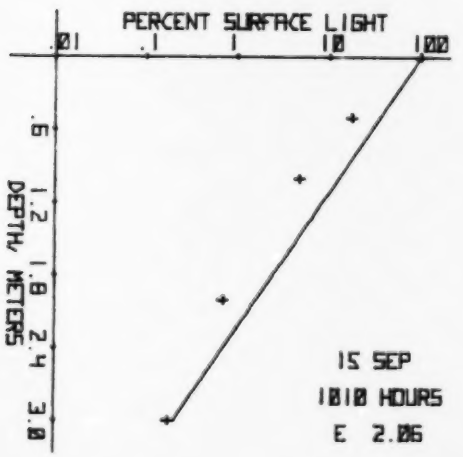
LAKE 227

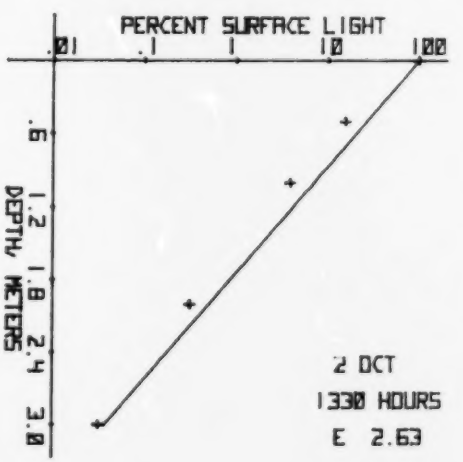

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
21 JUL
1015 HOURS
E 2.46


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
4 AUG
1030 HOURS
E 2.31

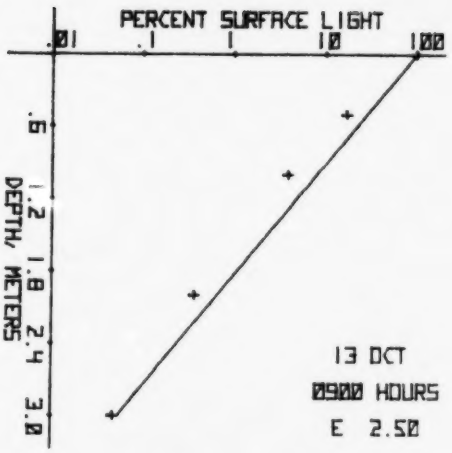

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.8
1.6
2.4
3.2
4.0
15 AUG
1530 HOURS
E 2.34

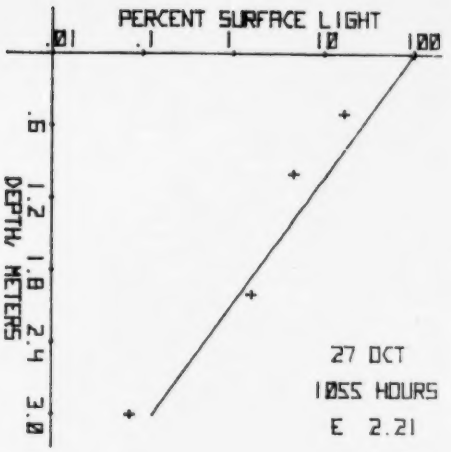

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
1 SEP
1025 HOURS
E 2.06


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
15 SEP
1010 HOURS
E 2.06

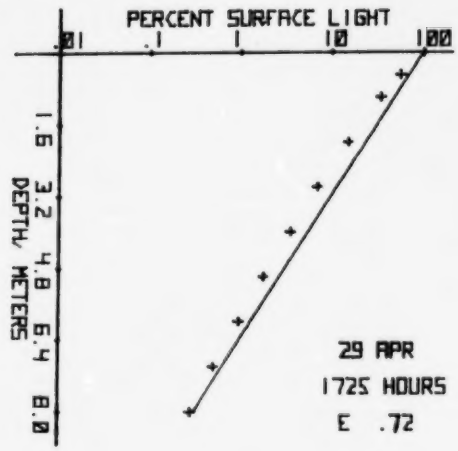

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
.6
1.2
1.8
2.4
3.0
2 OCT
1330 HOURS
E 2.63

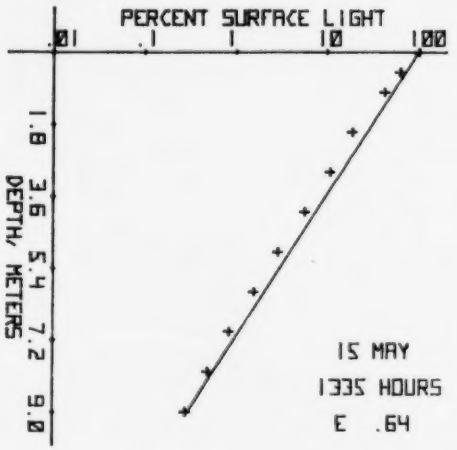
LAKE 227

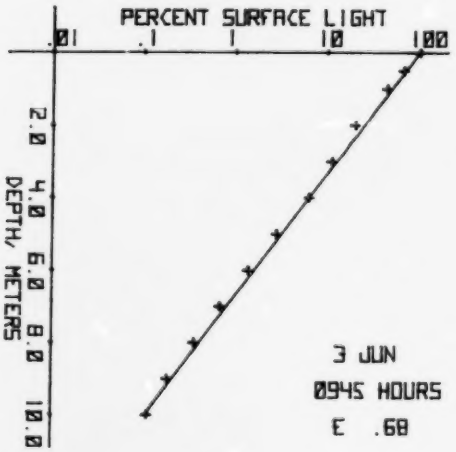

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
.6
1.2
1.8
2.4
3.0
13 OCT
0900 HOURS
E 2.50

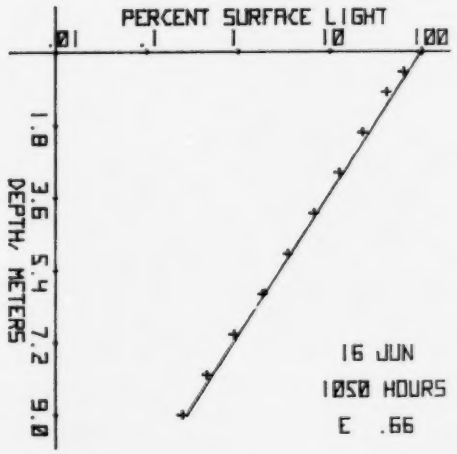

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
.6
1.2
1.8
2.4
3.0
27 OCT
1055 HOURS
E 2.21

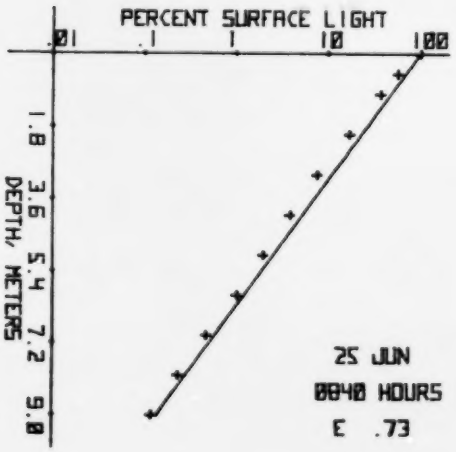
LAKE 239

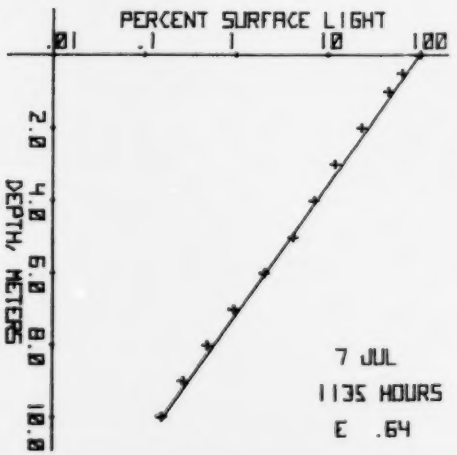

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
29 APR
1725 HOURS
E .72


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
15 MAY
1335 HOURS
E .64

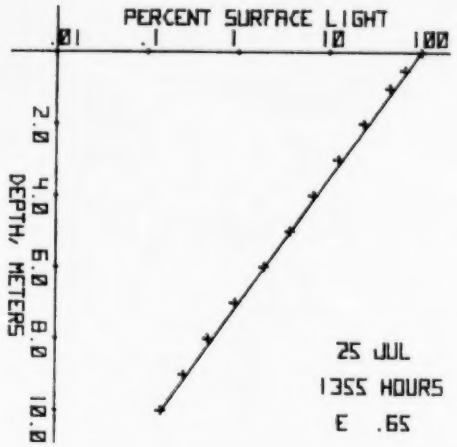

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
2.0
4.0
6.0
8.0
10.0
3 JUN
0945 HOURS
E .68

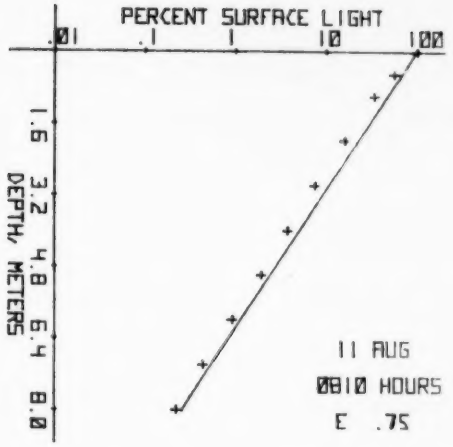

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
16 JUN
1050 HOURS
E .66

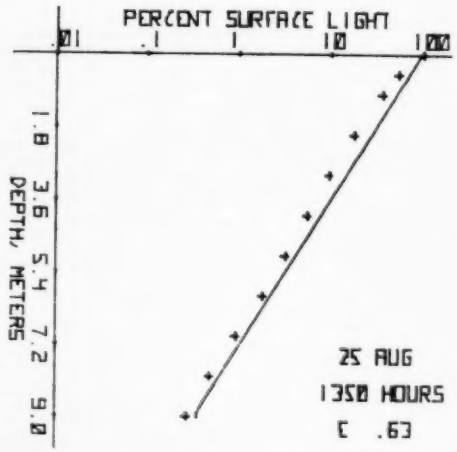

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
25 JUN
0840 HOURS
E .73

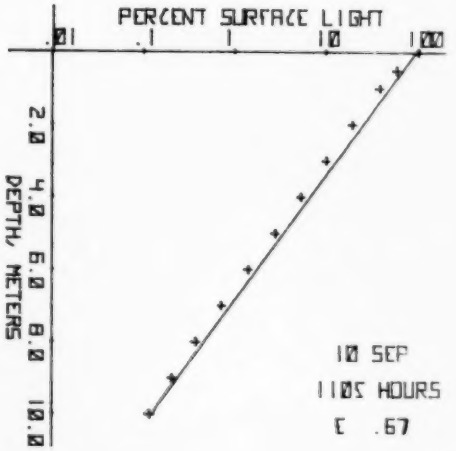

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
2.0
4.0
6.0
8.0
10.0
7 JUL
1135 HOURS
E .64

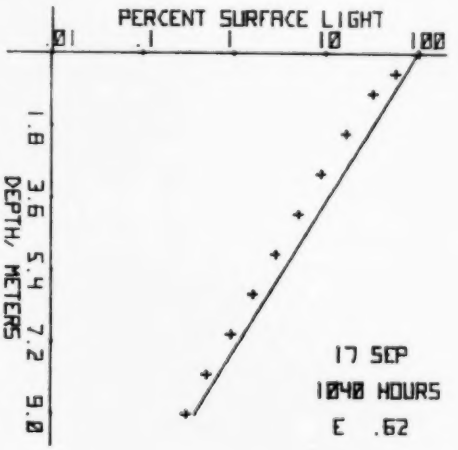
LAKE 239

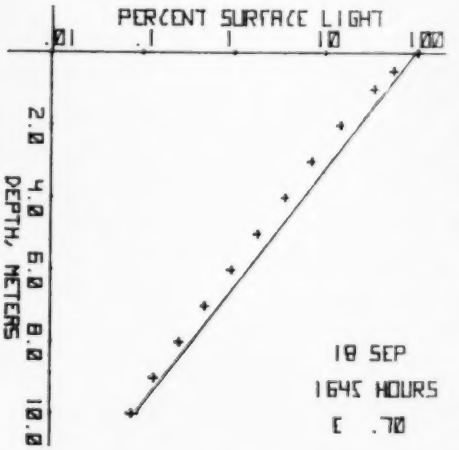

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.0
4.0
6.0
8.0
10.0
DEPTH, METERS
25 JUL
1355 HOURS
E .65


PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.6
3.2
4.8
6.4
8.0
DEPTH, METERS
11 AUG
0810 HOURS
E .75

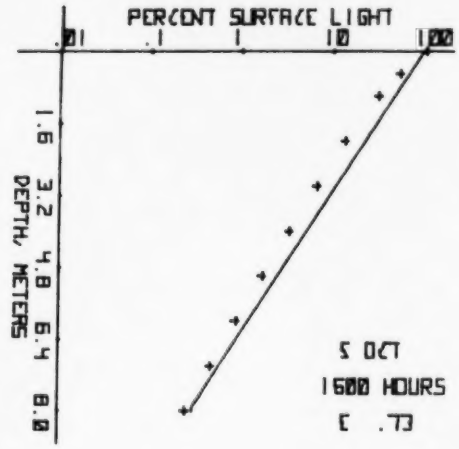

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.8
3.6
5.4
7.2
9.0
DEPTH, METERS
25 AUG
1350 HOURS
E .63

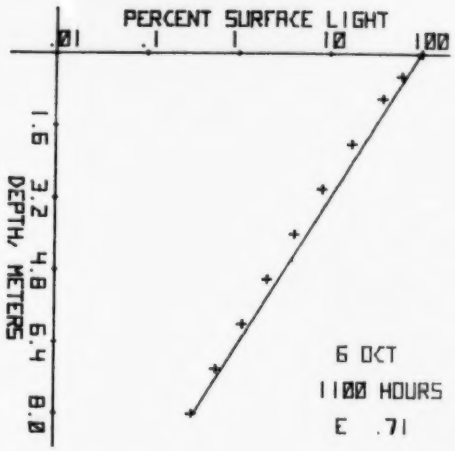

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.0
4.0
6.0
8.0
10.0
DEPTH, METERS
10 SEP
1105 HOURS
E .67

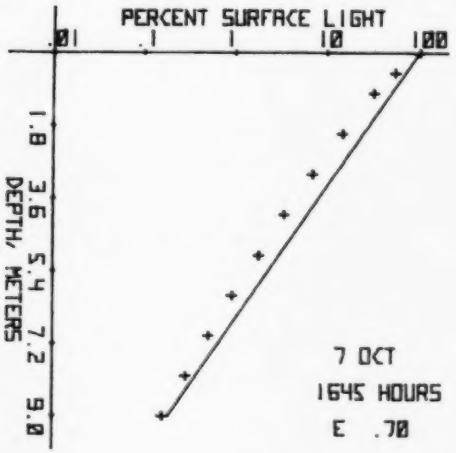

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.8
3.6
5.4
7.2
9.0
DEPTH, METERS
17 SEP
1040 HOURS
E .62

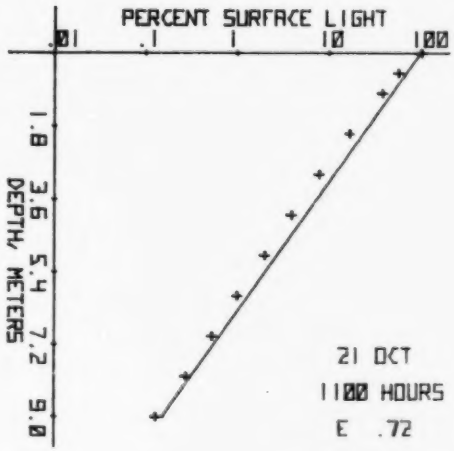

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.0
4.0
6.0
8.0
10.0
DEPTH, METERS
18 SEP
1645 HOURS
E .70

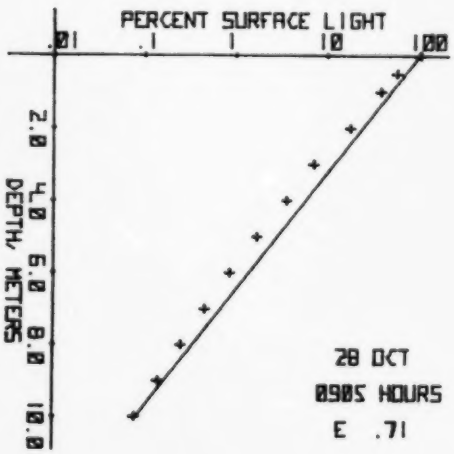
LAKE 239


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
5 OCT
1600 HOURS
E .73

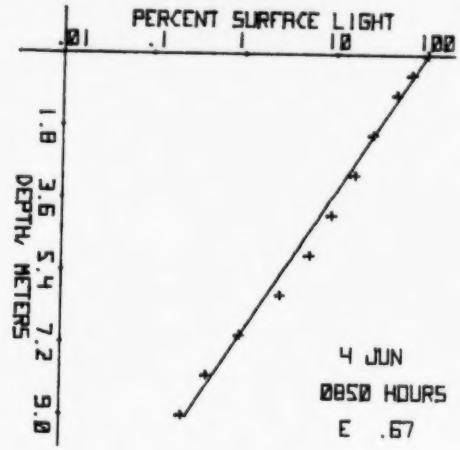

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.6
3.2
4.8
6.4
8.0
6 OCT
1100 HOURS
E .71

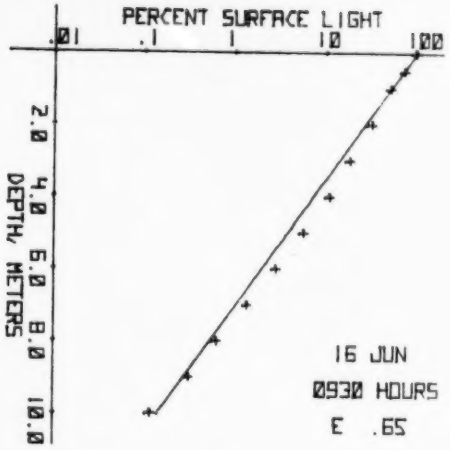

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
7 OCT
1645 HOURS
E .70

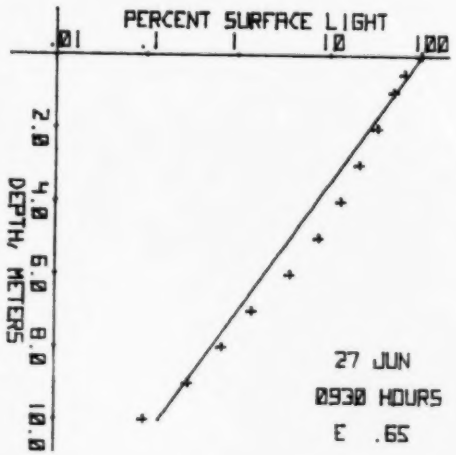

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
21 OCT
1100 HOURS
E .72

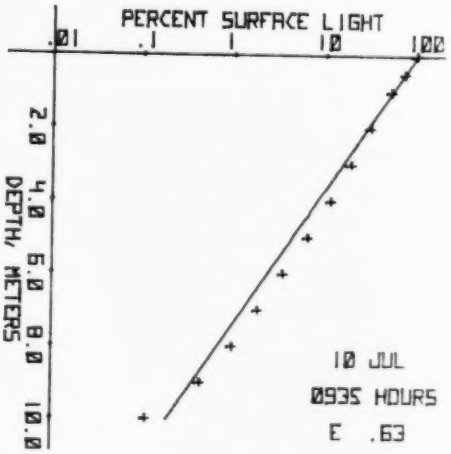

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
2.0
4.0
6.0
8.0
10.0
28 OCT
0905 HOURS
E .71

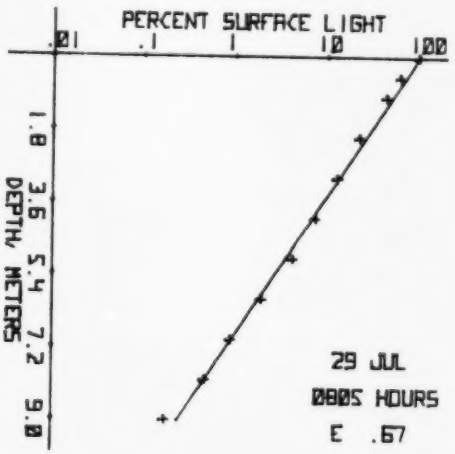
LAKE 302 N

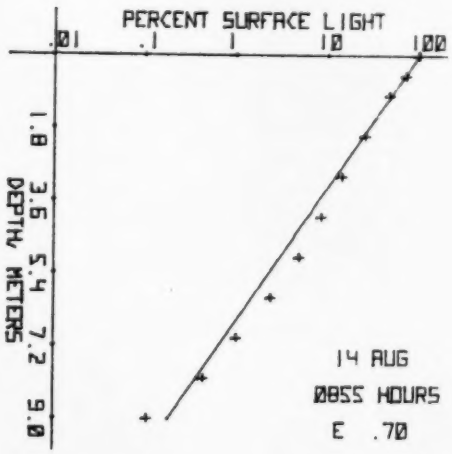

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.8
3.6
5.4
7.2
9.0
DEPTH, METERS
4 JUN
0850 HOURS
E .67


PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.0
4.0
6.0
8.0
10.0
DEPTH, METERS
16 JUN
0930 HOURS
E .65

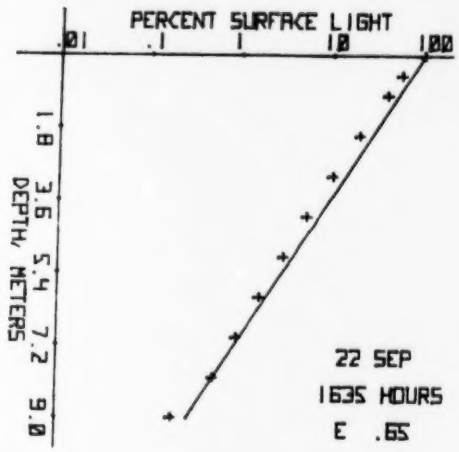

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.0
4.0
6.0
8.0
10.0
DEPTH, METERS
27 JUN
0930 HOURS
E .65

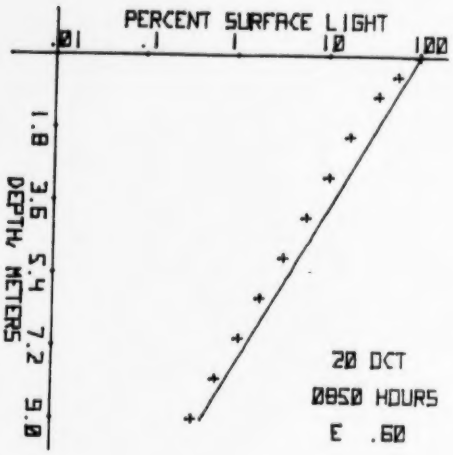

PERCENT SURFACE LIGHT
.01
.1
1
10
100
2.0
4.0
6.0
8.0
10.0
DEPTH, METERS
10 JUL
0935 HOURS
E .63

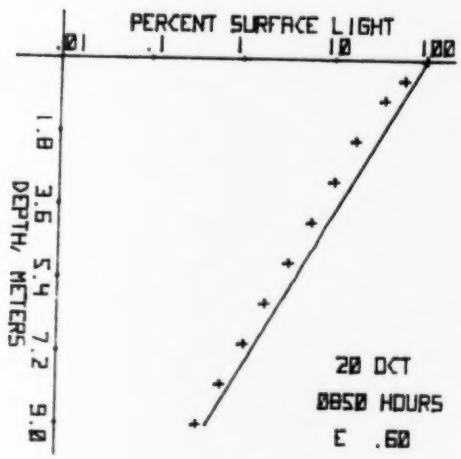

PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.8
3.6
5.4
7.2
9.0
DEPTH, METERS
29 JUL
0805 HOURS
E .67


PERCENT SURFACE LIGHT
.01
.1
1
10
100
1.8
3.6
5.4
7.2
9.0
DEPTH, METERS
14 AUG
0855 HOURS
E .70

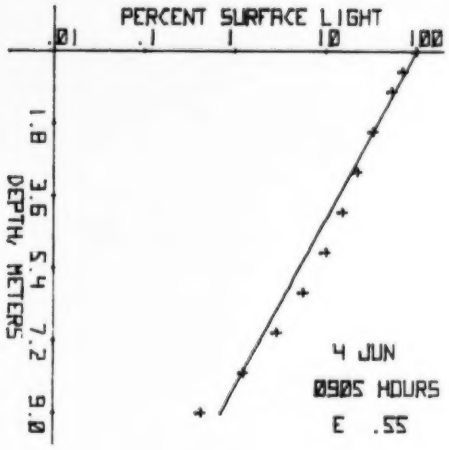
LAKE 302 N

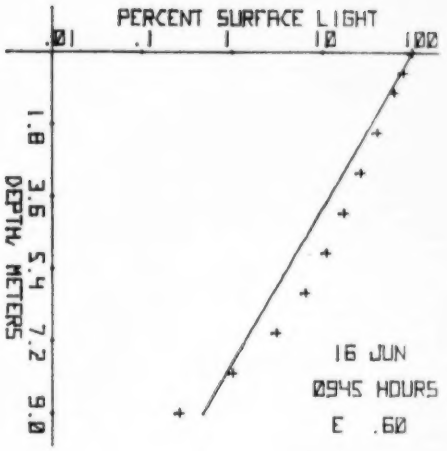

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
22 SEP
1635 HOURS
E .65

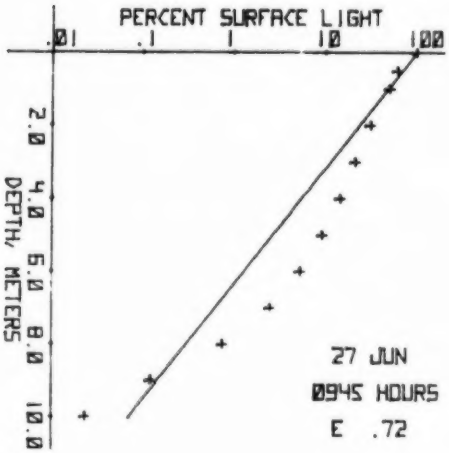

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
20 OCT
0850 HOURS
E .60

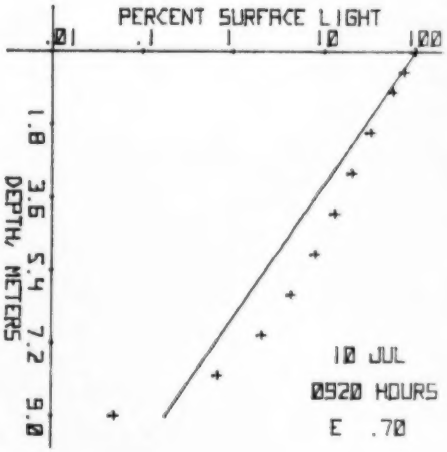

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
20 OCT
0850 HOURS
E .60

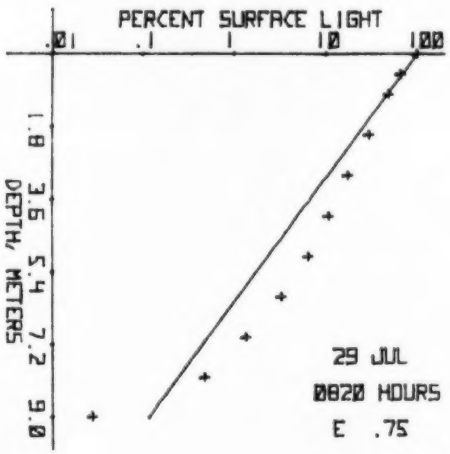
LAKE 302 S

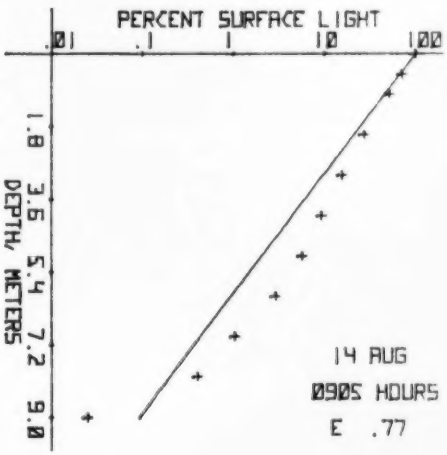

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
4 JUN
0905 HOURS
E .55


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
16 JUN
0945 HOURS
E .60

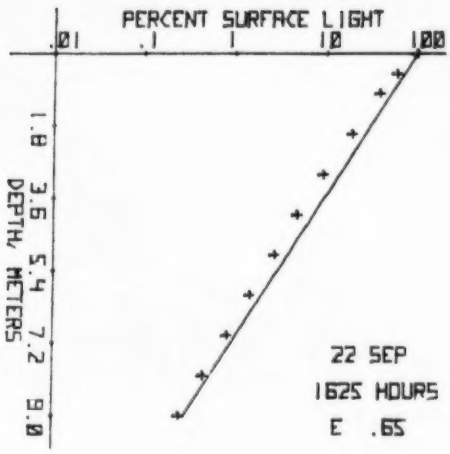

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
2.0
4.0
6.0
8.0
10.0
27 JUN
0945 HOURS
E .72

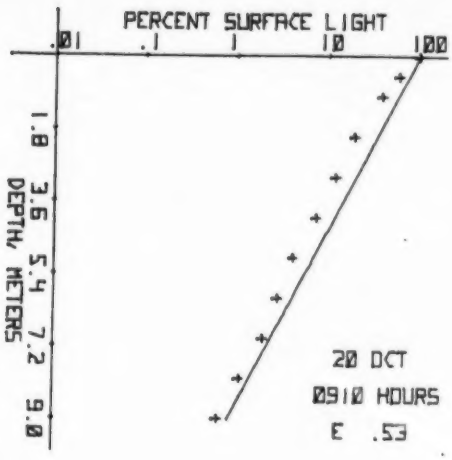

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
10 JUL
0920 HOURS
E .70

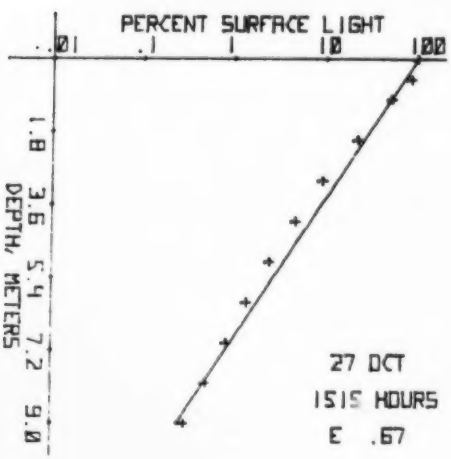

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
29 JUL
0820 HOURS
E .75


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
14 AUG
0905 HOURS
E .77

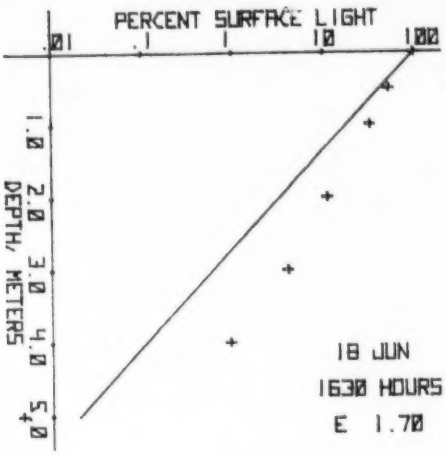
LAKE 302 S

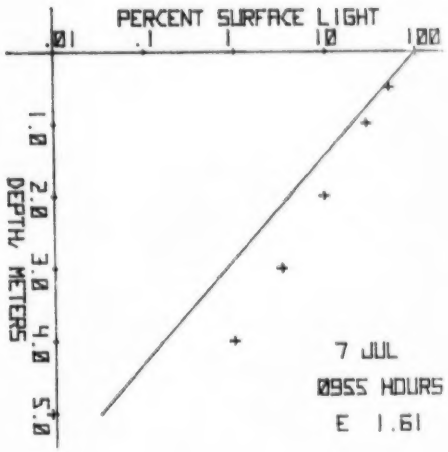

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
22 SEP
1625 HOURS
E .65

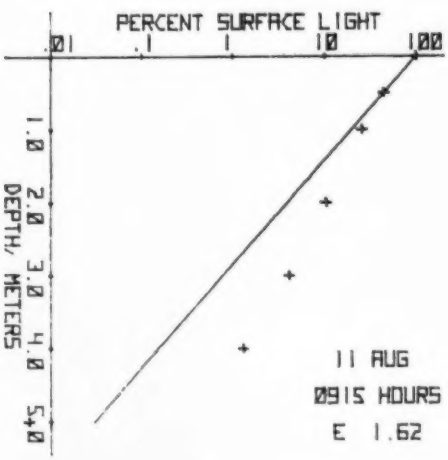

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
20 OCT
0910 HOURS
E .53

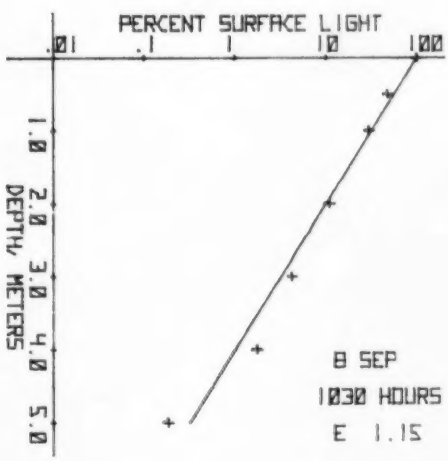

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.8
3.6
5.4
7.2
9.0
27 OCT
1515 HOURS
E .67

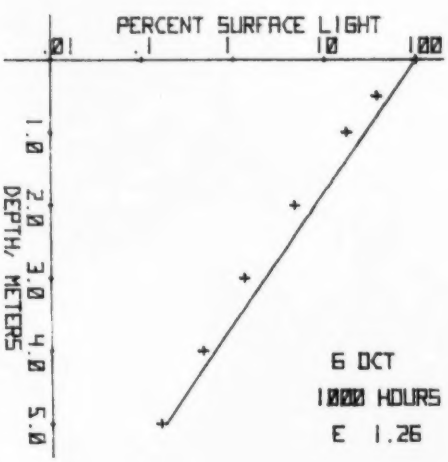
LAKE 304


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
0.1
2.0
3.0
4.0
5.0
18 JUN
1630 HOURS
E 1.70

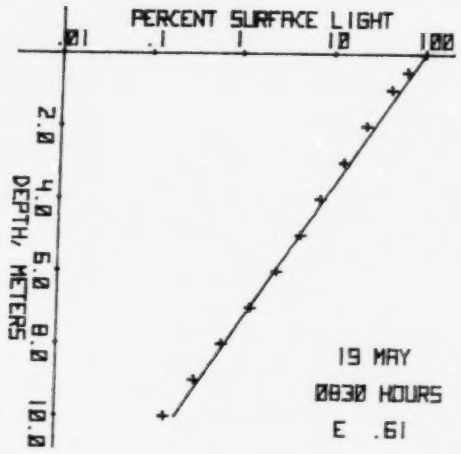

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.0
2.0
3.0
4.0
5.0
7 JUL
0955 HOURS
E 1.61

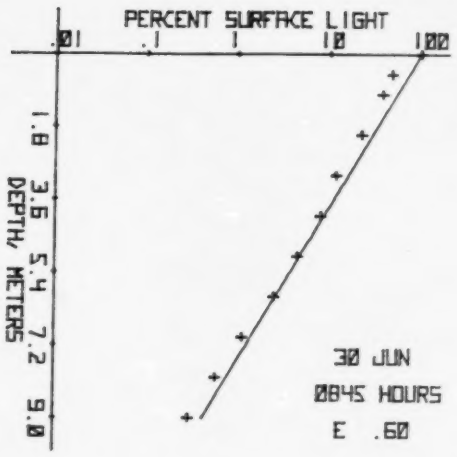

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
0.1
2.0
3.0
4.0
5.0
11 AUG
0915 HOURS
E 1.62

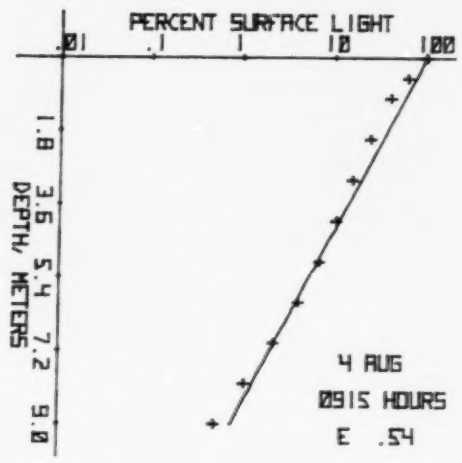

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
1.0
2.0
3.0
4.0
5.0
8 SEP
1030 HOURS
E 1.15

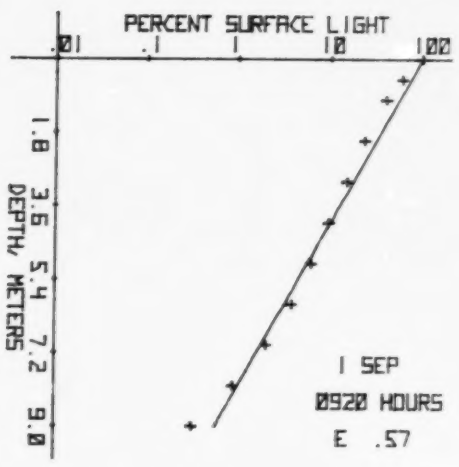

PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH, METERS
0.1
2.0
3.0
4.0
5.0
6 OCT
1000 HOURS
E 1.26

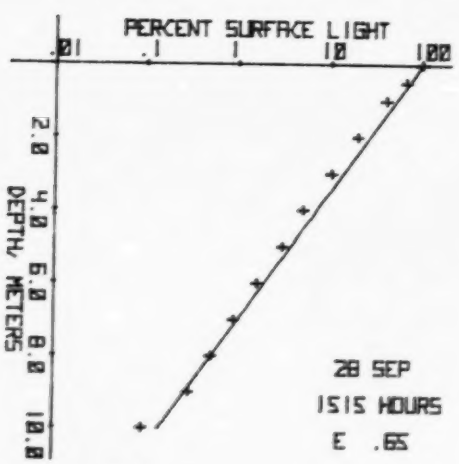
LAKE 382

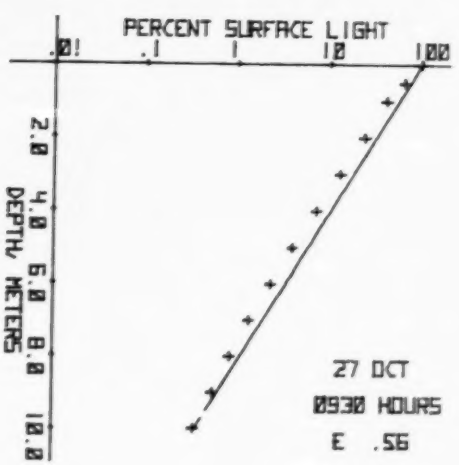

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
2.0 4.0 6.0 8.0 10.0
19 MAY
0830 HOURS
E .61


PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.8 3.6 5.4 7.2 9.0
30 JUN
0845 HOURS
E .60

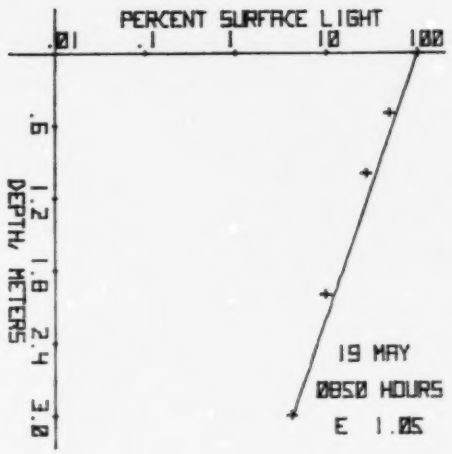

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.8 3.6 5.4 7.2 9.0
4 AUG
0915 HOURS
E .54

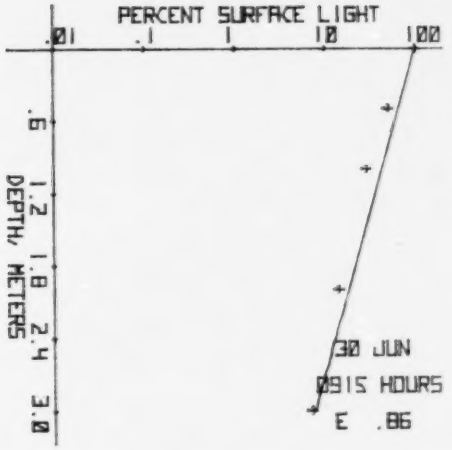

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
1.8 3.6 5.4 7.2 9.0
1 SEP
0920 HOURS
E .57

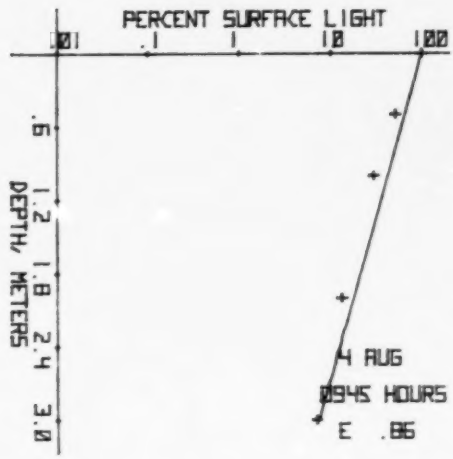

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
2.0 4.0 6.0 8.0 10.0
28 SEP
1515 HOURS
E .65

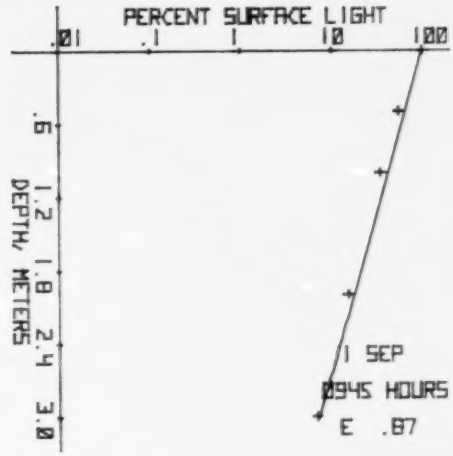

PERCENT SURFACE LIGHT
.01 .1 1 10 100
DEPTH, METERS
2.0 4.0 6.0 8.0 10.0
27 OCT
0930 HOURS
E .56

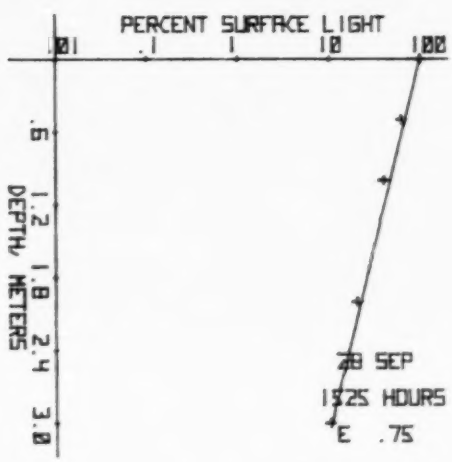
LAKE 382 BAY

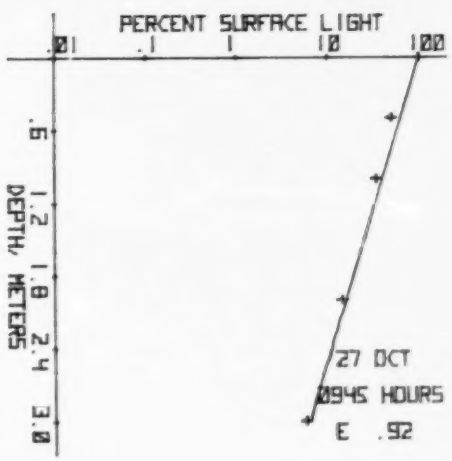

PERCENT SURFACE LIGHT
.01 .1 1 10 100
.6 1.2 1.8 2.4 3.0
DEPTH METERS
19 MAY
0850 HOURS
E 1.05


PERCENT SURFACE LIGHT
.01 .1 1 10 100
.6 1.2 1.8 2.4 3.0
DEPTH METERS
30 JUN
0915 HOURS
E .86

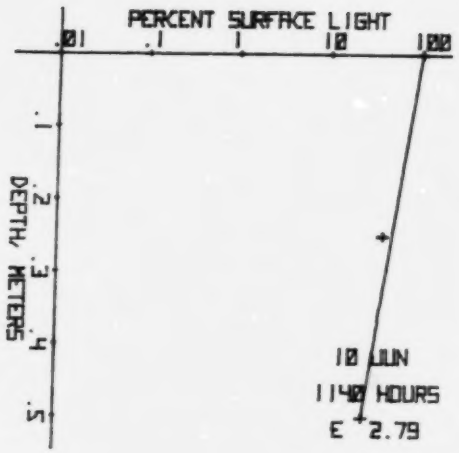

PERCENT SURFACE LIGHT
.01 .1 1 10 100
.6 1.2 1.8 2.4 3.0
DEPTH METERS
4 AUG
0945 HOURS
E .86

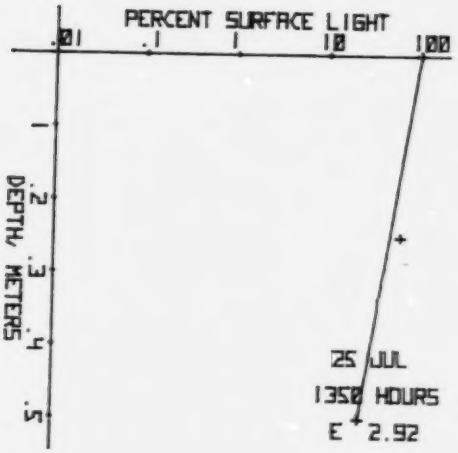

PERCENT SURFACE LIGHT
.01 .1 1 10 100
.6 1.2 1.8 2.4 3.0
DEPTH METERS
1 SEP
0945 HOURS
E .87

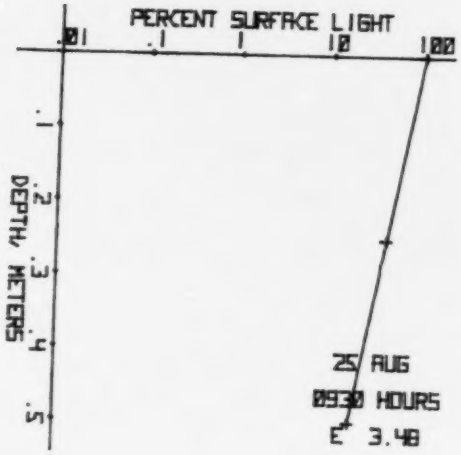

PERCENT SURFACE LIGHT
.01 .1 1 10 100
.6 1.2 1.8 2.4 3.0
DEPTH METERS
28 SEP
1325 HOURS
E .75

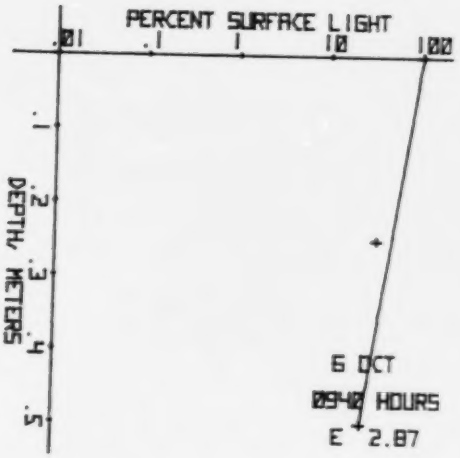

PERCENT SURFACE LIGHT
.01 .1 1 10 100
.6 1.2 1.8 2.4 3.0
DEPTH METERS
27 OCT
0945 HOURS
E .92

LAKE 661


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
.1
.2
.3
.4
.5
10 JUN
1140 HOURS
E 2.79


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
.1
.2
.3
.4
.5
25 JUL
1350 HOURS
E 2.92


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
.1
.2
.3
.4
.5
25 AUG
0930 HOURS
E 3.48


PERCENT SURFACE LIGHT
.01
.1
1
10
100
DEPTH METERS
.1
.2
.3
.4
.5
6 OCT
0940 HOURS
E 2.87

Printed in Canada by
Supply and Services Canada
Printing Office
for exclusive distribution by
Fisheries and Oceans Canada
Freshwater Institute
Winnipeg, Manitoba
Canada